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REPORT

ON THE

SCIENTIFIC RESULTS

OF THE

VOYAGE OF H.M.S. CHALLENGER

DURING THE YEARS 1873-76

UNDER THE COMMAND OF

CAPTAIN GEORGE S. NARES, R.N., F.R.S.

AND THE LATE

CAPTAIN FRANK TOURLE THOMSON, R.N.

PREPARED UNDER THE SUPERINTENDENCE OF

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PART XLIV.—REPORT ON THE CEPHALOPODA

BY WILLIAM EVANS HOYLE, M.A. (OXON.), M.R.C.S., F.R.S.E.

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EDITORIAL NOTE.

Professor T. H. Huxley at one time proposed to undertake the description of the Cephalopoda brought home by the Expedition. His many engagements, however, compelled him to give up this intention, so far as regards the whole collection, but he retained, and is now engaged in the preparation of a Report on, the genus Spirula. The remainder of the Cephalopod collection was placed in the hands of Mr. W. E. Hoyle, in 1883, soon after his appointment as Naturalist on the Editorial Staff of the Challenger Reports.

The results of Mr. Hoyle's investigations are given in this part, which, in addition to the description of many new forms, will be found to contain an able revision of our knowledge of existing species up to the present time.

The Manuscript was received in instalments between the 20th January and 30th April 1886.

John Murray.

Challenger Office, 32 Queen Street,
Edinburgh, 15*th August* 1886.

ERRATA.

Page 14, line 8 from bottom *for* vol. iv. *read* vol. vi.
Page 67, at the top of the page insert "Division II. **Trachyglossa**, Lütken."
Page 68, line 7 from bottom, *for* "*Bobitæna*" *read* "*Bolitæna*,"
Page 136, line 6, *for* "Gray" *read* "Quoy."
Page 217, line 4 from bottom, *for* "*Monchezia*" read "*Mouchezia*."
Page 219, after line 20, insert "*Architeuthus martensi*."
Page 220, footnote, *for* "d'Abigny" *read* "d'Orbigny."

THE

VOYAGE OF H.M.S. CHALLENGER.

ZOOLOGY.

REPORT on the CEPHALOPODA collected by H.M.S. Challenger during the years 1873–76. By WILLIAM EVANS HOYLE, M.A. (Oxon.), M.R.C.S., F.R.S.E., Naturalist on the Editorial Staff of the Challenger Reports.

PREFACE.

ON the return of the Challenger the whole collection of Cephalopoda was placed by Sir Wyville Thomson in the hands of Professor Huxley for examination and description, and it will be regretted by all naturalists that this Report was not prepared by that eminent master in the science of comparative anatomy. Professor Huxley's numerous engagements, however, prevented him from undertaking more than the investigation of the single specimen of *Spirula* which was obtained by the Expedition. The remainder of the collection was offered to me by Mr. John Murray in the autumn of 1882, and within the first few weeks of 1883 I received the specimens from South Kensington. Since that period almost all my spare time has been occupied in the work of drawing up the present Report.

The lack of any collection of Cephalopoda in Edinburgh rendered progress slow at first, but in the summer of 1884, by the invitation of Professor Steenstrup, I took the Challenger specimens over to Copenhagen and spent a month in comparing them with the unrivalled collection in the Zoological Museum of that city. I have also paid two visits to the British Museum, and one of only a day or two in duration to the Museum of the Jardin des Plantes in Paris. In this connection I must express my thanks in the first place to Mr. John Murray for having placed so important and interesting a

piece of work in my hands, and for the kindness and consideration with which he has at all times assisted me in carrying it out. I am indebted also to Dr. Günther and Mr. Edgar A. Smith for facilitating my examination of the National Collection, and to the latter gentleman in particular for notes and comparisons which he has been good enough to make for me. In addition, my thanks are due to Professor E. Ray Lankester, F.R.S., to Dr. Paul Fischer, and to my friend Dr. Georg Pfeffer for having courteously answered a number of questions regarding specimens in their charge; to Dr. Jatta of the Naples Zoological Station; to Dr. P. H. Carpenter, F.R.S., for information regarding the cruise of the "Porcupine"; to Dr. A. T. de Rochebrune for having shown me several of the valuable type specimens in the Museum of the Jardin des Plantes; and to Dr Murie, the able librarian of the Linnean Society, for assistance in the bibliography of the subject.

No ordinary acknowledgment, however, is sufficient to indicate the extent of my obligation to my good friend Professor Steenstrup; not only did he allow me during my sojourn in Copenhagen the greatest freedom of access to the invaluable collection under his charge, but also gave up many hours to assist me in the work of comparison, and since my return he has been good enough to answer numerous questions regarding points of uncertainty or confusion, and has read over the proofs of this Report, which has thus been saved from many errors, which it must otherwise have contained.

In addition to the Challenger collection the present memoir treats of those obtained by H.M.SS. "Porcupine," "Knight Errant," and "Triton;" those from the two latter expeditions were placed in my hands by Mr. John Murray, while the specimens collected by the "Porcupine," which had been handed by the late Dr. Gwyn Jeffreys to Professor Steenstrup, were transferred by him to me that they might be treated of along with the others; a few specimens from the "Valorous" Expedition were also received with them.

The present Report is almost exclusively systematic in its scope, but I hope to be able within a year to prepare a Supplement giving an account of the anatomical examination of those specimens which are available for the purpose.

The ten years which have now elapsed since the return of the Challenger, have to some extent impaired the novelty of this Report; in that interval marine zoological investigation in general, and deep-sea dredging in particular, have been so energetically prosecuted, that no less than five genera which were first collected by the Challenger have been since described from other sources.[1]

[1] *Alloposus, Eledonella, Inioteuthis, Mastigoteuthis, Calliteuthis.*

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EXPLANATION OF THE PLATES.

A PROVISIONAL SYNOPSIS OF RECENT CEPHALOPODA.

THE latest attempt to give a complete systematic account of the Cephalopoda is that of Tryon, published in 1879;[1] but it labours under several disadvantages—the first and most serious being that the author has given almost all his attention to Conchology properly so-called, and has apparently treated the Cephalopods rather with a view of making his Manual complete than from any special interest in them; secondly, the mode of arrangement adopted of placing all the synonymy in the form of an alphabetical index at the end of the volume renders it exceedingly difficult to ascertain what he includes under each species, and, furthermore, a large number of new forms have been described since the publication of his work, and several important contributions have been made to our knowledge of the relations of previously described groups.

Under these circumstances it appeared that the compilation of such a list as the present, even though it might fail, indeed necessarily must fail, to give a completely satisfactory survey of the class, would nevertheless be of considerable use to workers in this interesting branch of Malacology, were it only as a reliable index to the literature of the subject, and I therefore resolved to draw up in a form fit for publication the material gathered for use in my own investigations, and received Mr. Murray's assent to its being included in the present Report. I should, however, be doing injustice to Mr. Tryon did I not acknowledge my indebtedness to his elaborate and careful index.

At present no systematic treatment of the whole class of Cephalopoda can hope to be other than provisional, such a large percentage of the published descriptions of species being inaccurate or insufficient for modern requirements, that nothing satisfactory can be obtained until some worker shall do for this group what Lyman did for the Ophiuroidea and Agassiz for the Echini,—travel to the various museums and re-examine all such type specimens as are at present extant; and in the present instance it would be particularly desirable that he should have the opportunity of comparing the different specimens side by side.

With respect to the list itself, I have endeavoured to give a reference to the original creation of each species and such others as might be necessary to indicate the important points in its history, or good descriptions and figures of it; save in one or two cases of

[1] Manual of Conchology, vol. i.

special interest, I have not attempted to give complete synonymies. I have especially avoided registering species as identical without such evidence as seemed to me absolutely conclusive, for, so far from tending to simplicity and clearness, hasty and indiscriminate identifying of species can only lead to the utmost confusion. It is too much to hope that there should be no mistakes in the references, but every care has been taken to reduce them to a minimum; with the exception of a few, where the contrary is distinctly stated, they have all been personally verified by myself.

The Classification adopted is not identical with any previously published, but I have endeavoured to select what was best from the works of my predecessors, modifying their results when it seemed necessary. A systematic arrangement of this class, based on a complete knowledge of their anatomy and development, as well as of their external characters, is still and will long remain a desideratum.

The present list contains 388 species, which are disposed in 68 genera, and these in 14 families; of which numbers 32 species, 4 genera, and 1 family are new to science. Of these at least 60 or 70 species have been inadequately characterised, so that it is unlikely that they could be recognised from the published descriptions, and the same is true of several of the genera; hence it may be said in round numbers that we are acquainted with 50 genera of recent Cephalopoda containing 300 species. It is worthy of remark that 29 or half the genera contain only one species each, while nearly one-half the species (170) belong to the three genera *Octopus*, *Sepia*, and *Loligo*.

Class CEPHALOPODA, Cuvier.

Siphonopoda, Lankester.

Order I. DIBRANCHIATA, Owen, 1832.

Suborder I. OCTOPODA, Leach, 1818.

Division 1. Lioglossa,[1] Lütken, 1882.

Family I. Pteroti, Reinhardt et Prosch.

Cirroteuthidæ, Keferstein.

Cirroteuthis, Eschricht, 1836.

Sciadephorus, Reinhardt et Prosch, 1846.
Bostrychoteuthis, Agassiz, 1846.

1. *Cirroteuthis mülleri*, Eschricht.

1836. *Cirroteuthis Mülleri*, Eschr., Nova Acta Acad. Cæs. Leop.-Carol., t. xviii. p. 627, tabb. xlvi.–xlviii.
1846. *Sciadephorus Mülleri*, Reinh. og Prosch, Om Sciadephorus Mülleri,[2] Kjøbenhavn.

2. *Cirroteuthis umbellata*, Fischer.

1883. *Cirroteuthis umbellata*, Fischer, Journ. de Conch., t. xxiii. p. 402.

3. *Cirroteuthis magna*, Hoyle (Pl. XI. figs. 3–5 ; Pl. XII.; Pl. XIII. figs. 1–4 ; p. 56).

1885. *Cirroteuthis magna*, Hoyle, Diagnoses I., p. 233.

4. *Cirroteuthis pacifica*, Hoyle (Pl. X.; p. 61).

1885. *Cirroteuthis pacifica*, Hoyle, Diagnoses I., p. 235.

5. *Cirroteuthis meangensis*, Hoyle (Pl. IX. figs. 12, 13 ; Pl. XI figs. 1, 2 ; Pl. XIII. figs. 5, 6 ; p. 63).

1885. *Cirroteuthis meangensis*, Hoyle, Diagnoses I., p. 234.

6. *Cirroteuthis plena*, Verrill.

1885. *Cirrhoteuthis plena*, Vll., Third Catal., p. 404, pl. xlii. fig. 3.

7. *Cirroteuthis megaptera*, Verrill.

1885. *Cirrhoteuthis megaptera*, Vll., Third Catal., p. 405, pl. xliii. figs. 1, 2.

[1] Without a radula (Dyreriget, p. 543, Kjøbenhavn, 1881–82).
[2] *K. dansk. Vidensk. Selsk. Afhandl.*, Bd. xii. pp. 185–224, tabb. i.–v.

Stauroteuthis, Verrill, 1879.

1. *Stauroteuthis syrtensis*, Verrill.

1879. *Stauroteuthis syrtensis*, Vll., Amer. Journ. Sci. and Arts, vol. xviii. p. 468.
1881. „ „ Vll., Ceph. N. E. Amer., p. 382, pl. xxxii. figs. 1–5.

Opisthoteuthis, Verrill, 1883.

1. *Opisthoteuthis agassizii*, Verrill.

1883. *Opisthoteuthis Agassizii*, Vll., "Blake" Suppl., p. 113, pl. i. fig. 1; pl. ii. fig. 1.

Division 2. Trachyglossa, Lütken,[1] 1882.

Family II. Amphitretidæ, n. fam.

Amphitretus, Hoyle, 1885.

1. *Amphitretus pelagicus*, Hoyle (Pl. IX. figs. 7–9; p. 67).

1885. *Amphitretus pelagicus*, Hoyle, Diagnoses I., p. 235.

Family III. Argonautidæ, Cantraine, 1841.

Argonauta, Linné,[2] 1756.

Ocythoë, Leach et Auctt. (*non* Rafinesque).

1. *Argonauta argo*, Linné (p. 69).

1758. *Argonauta argo*, Linn., Syst. Nat., ed. x. p. 708; No. 282, 231.
1817. „ *haustrum*, Dillwyn, Descr. Catal., p. 335 (=*forma aurita*).
1838. „ *argo*, d'Orb., Céph. acét.; Argonaute, pl. ii. figs. 1, 2.
1853. „ *Gruneri*, Dunker, Zeitschr. f. Malak., 1852, p. 48 (=*forma mutica*).
1861. „ „ Reeve, Conch. Icon., pl. iii. fig. 2*b* (=*forma mutica*).
1861. „ *argo*, Reeve, Conch. Icon., pl. iii. fig. 2*c*.
1861. „ *haustrum*, Reeve, Conch. Icon., pl. ii. (=*forma aurita*).

2. *Argonauta tuberculata*, Shaw.

... *Argonauta tuberculatus*, Shaw, Nat. Miscell., vol. xxiii. tab. 995.[3]
1786. „ *nodosa*, Solander, Portl. Catal., 76, 2120 (vol. ii. p. 113).
1786. „ *navicula*, Solander, Portl. Catal., 42, 1055 (=*forma aurita*) (vol. ii. p. 112).
1787. „ *oryzata*, Meuschen, Mus. Gevers., 252, No. 133.
1817. „ *gondola*, Dillwyn, Descr. Catal. (=*forma aurita*).
1822. „ *tuberculosa*, Lmk., Anim. s. vert., t. vii. p. 652.
1861. „ „ Reeve, Conch. Icon., pl. i. (=*forma mutica*).

[1] *Op. cit.*, p. 543. As I did not feel justified in removing the buccal organs from the small solitary specimen of *Amphitretus pelagicus* in the collection, I am unable to say whether it belongs to the Trachyglossa or the Lioglossa.

[2] Having had no opportunity of forming an independent opinion as to the values of the various recorded species of Argonaut, I have followed von Martens (*Ann. and Mag. Nat. Hist.*, ser. 3, vol. xx. p. 103, 1867), and added such other species as have been described since the publication of that paper.

[3] I have been unable to ascertain beyond doubt when this was published, for the volume bears no date. Dillwyn (*op. cit.*, p. xi.) gives 1790; if this be correct Solander's name should take precedence.

3. *Argonauta hians*, Solander.

1786. *Argonauta hians*, Solander, Portl. Catal., p. 44, lat. 1055 (vol. ii. p. 113).[1]
1822. „ *nitida*, Lmk., Anim. s. vert., t. vii. p. 653.
1850. „ *Owenii*, Ad. and Rv., Voy. "Samarang," Moll, pl. iii. fig. 1.
1850. „ *gondola*, Ad. and Rv., *Op. cit.*, pl. ii.
1852. „ *Kochiana*, Dunker, Zeitschr. f. Malak., p. 49 (= var.).
1861. „ *gondola*, Reeve, Conch. Icon., pl. iv. figs. 3*a*, 3*b*.

4. *Argonauta pacifica*, Dall.

1872. *Argonauta pacifica*, Dall, Amer. Journ. Conch., vol. vii. p. 95.

5. *Argonauta expansa*, Dall.

1873. *Argonauta expansa*, Dall, Proc. Calif. Acad., N.S., vol. iv. p. 303.

6. *Argonauta bœttgeri*, Maltzan.

1881. *Argonauta Bœttgeri*, Maltzan, Journ. de Conch., t. xxix. p. 163, pl. ix. fig. 7.

7. *Argonauta gracilis*, Kirk.

1885. *Argonauta gracilis*, Kirk, Trans. N. Zeal. Inst., vol. xvii. p. 58, pl. xiii.

Ocythoë, Rafinesque, 1814 (*non* Leach et auctt.).

Parasira, Steenstrup.

1. *Ocythoë tuberculata*, Rafinesque.[2]

1814. *Ocythoë tuberculata*, Raf., Précis découv. somiol., p. 29.
1828. *Octopus catenulatus*, Fér., Céph. acét.; Poulpes, pl. vi. *bis et ter*.
1837. „ *Carenæ*, Vér., Mem. Accad. Sci. Torino, ser. 2, t. i. p. 92, pl. ii.
1838. *Philonexis tuberculatus*, d'Orb., Céph. acét., p. 87; Poulpes, pl. vi. *bis et ter*, pl. xxiii.
1840. *Ocythoë tuberculata*, Raf., Good Book, p. 63.
1849. *Philonexis Alcœus* (*?*), Gray, B.M.C., p. 26.
1851. *Octopus catenulatus*, Vér., Céph. médit., p. 37, pl. xiii.
1851. „ *Carena*, Vér., Céph. médit., p. 34, pl. xiv. figs. 2, 3; pl. xli. figs. 1, 2.
1861. *Parasira catenulata*, Stp., Vid. Meddel. nat. Foren. Kjøbenhavn, Aar 1860, p. 333.
1869. „ „ Targ., Cef. Mus. Firenze, p. 11.
1869. „ *tuberculata*, Targ., *Op. cit.*, p. 13.
1880. *Ocythoë tuberculata*, Stp., Ommat. Blækspr., p. 104.
1881. *Parasira catenulata*, Vll., Ceph. N. E. Amer., p. 362, pl. xxxiii. fig. 2.

[1] I have not had an opportunity of seeing the Portland Catalogue but the references in brackets are taken from a copy of Solander's MS. in the Linnean Society's Library, for the knowledge of which I am indebted to Dr. Murie; it was written by Humphreys and was formerly in the possession of G. B. Sowerby, from whom it was purchased for the sum of £5.

[2] It seems very improbable that this is the *Octopus tuberculatus* of Risso (Hist. Nat. Eur. Mérid., t. iv. p. 3, 1826); his description does not seem to me applicable to this form, in addition to which we have Verany's statement (Céph. médit., p. 40) that Risso did not recognise the drawing of *Octopus catenulatus* (*op. cit.*, pl. xiii.) as his species. There can, however, be no doubt that, as Steenstrup has recently pointed out (*loc. cit.*), this is the species which Rafinesque had in view in constituting the genus *Ocythoë*, which Leach and others have always understood to be the animal of the Argonaut, which Rafinesque clearly states was not the case (Good Book, *loc. cit.*).

Family IV. PHILONEXIDÆ, d'Orbigny, 1838.

Tremoctopus, delle Chiaje, 1830.

Philonexis, d'Orbigny.

1. *Tremoctopus violaceus*, delle Chiaje.

1830. *Tremoctopus violaceus*, d. Ch., Mem. stor. nat., pl. lxx. (*fide* Vér.).
1830. *Octopus velifer*, Fér., Poulpes, pls. xviii., xix. (*nomen tantum*).
1837. „ *velatus*, Rang, Mag. de Zool., cl. v. p. 60, pl. lxxxix.
1838. *Philonexis velifer*, d'Orb., Céph. acét., p. 91; Poulpes, pls. xviii.–xx., pl. xxiii. figs. 2–4.
1851. *Tremoctopus velifer*, Vér., Céph. médit., p. 41, pl. xiv. fig. 1.
1851. „ *violaceus*, Vér., *Ibid.*, p. 41, pls. xv., xvi.

2. *Tremoctopus quoyanus* (d'Orbigny), Steenstrup (Pl. XIII. fig. 7; p. 70).

1835. *Octopus* (*Philonexis*) *Quoyanus*, d'Orb., Amér. mérid., p. 17, pl. ii. figs. 6–8.
1838. *Philonexis Quoyanus*, d'Orb., Céph. acét., p. 96; Poulpes, pl. xvi. figs. 6–8, pl. xxiii. fig. 5.
1861. *Tremoctopus Quoyanus*, Stp., Vid. Meddel. nat. Foren. Kjøbenhavn, Aar 1860, p. 332.

3. *Tremoctopus gracilis* (Eydoux et Souleyet), Tryon (Pl. XIII. figs. 8, 9; p. 71).

1852. *Octopus gracilis*, E. et S., Voy. "Bonite," p. 13, pl. i. figs. 8, 9.
1879. *Tremoctopus gracilis*, Tryon, Man. Conch., vol. i. p. 131.

4. *Tremoctopus atlanticus* (d'Orbigny), Steenstrup (p. 71).

1835. *Octopus* (*Philonexis*) *atlanticus*, d'Orb., Amér. mérid., p. 19, pl. ii. figs. 1–4.
1838. *Philonexis atlanticus*, d'Orb., Céph. acét., p. 98; Poulpes, pl. xvi. figs. 4, 5.
1861. *Tremoctopus atlanticus*, Stp., Vid. Meddel. nat. Foren. Kjøbenhavn, Aar 1860, p. 332 (*err. typ.*).

5. *Tremoctopus microstomus* (Reynaud), Tryon.

1830. *Octopus microstomus*, Reynaud, Mag. de Zool., cl. v. p. 23, pl. xxiii.
1838. *Philonexis microstomus*, d'Orb., Céph. acét., p. 100; Poulpes, pl. x. fig. 5.
1851. *Octopus Koellikeri* (*?*), Vér., Céph. médit., p. 33, pl. xi. figs. A, B, C.
1879. *Tremoctopus microstomus*, Tryon, Man. Conch., vol. i. p. 130.

6. *Tremoctopus hyalinus* (Rang), Tryon.

1837. *Octopus hyalinus*, Rang, Mag. de Zool., cl. v. p. 66, pl. xcii.
1838. *Philonexis hyalinus*, d'Orb., Céph. acét., p. 104; Poulpes, pl. xvi. figs. 1–3.
1879. *Tremoctopus hyalinus*, Tryon, Man. Conch., vol. i. p. 131.

7 *Tremoctopus ocellatus*, Brock.

1882. *Tremoctopus ocellatus*, Brock, Zeitschr. f. wiss. Zool., Bd. xxxvi. p. 601, pl. xxxvii. figs. 1, 2.

8. *Tremoctopus semipalmatus* (Owen).

1836. *Octopus semipalmatus*, Owen, Trans. Zool. Soc. Lond., vol. ii. p. 112, pl. xxi. figs. 12, 13.

(Uncertain species.)

9. *Tremoctopus dubius* (Eydoux et Souleyet), Tryon.

1851. *Philonexis dubia*, Vér., Céph. médit., p. 34.
1852. *Octopus dubius*, E. et S., Voy. "Bonite," p. 15, pl. i. figs. 10–14.
1879. *Tremoctopus dubius*, Tryon, Man. Conch., vol. i. p. 131.

Family V. Alloposidæ, Verrill, 1881.

Alloposus, Verrill, 1880.

Haliphron (?), Steenstrup.

1. *Alloposus mollis*, Verrill (p. 72).

1859. *Haliphron atlanticus*, Stp., Vid. Meddel. nat. Foren. Kjøbenhavn, Aar 1858, p. 183.
1880. *Alloposus mollis*, Vll., Amer. Journ. Sci. and Arts, vol. xx. p. 394.
1881. „ „ Vll., Ceph. N. E. Amer., pp. 366, 420, pls. l., li. figs. 3, 4.

Family VI. Octopodidæ, d'Orbigny, 1838.

Octopidæ, d'Orb. (*pars*).

Octopus, Lamarck, 1799.

1. *Octopus vulgaris*, Lamarck.

1799. *Octopus vulgaris*, Lmk., Mém. Soc. Hist. Nat. Paris, t. i. p. 18.
1826. „ *brevitentaculatus (?)*, Blv., Dict. d. Sci. Nat., t. xliii. p. 187.
1838. „ *vulgaris*, d'Orb., Céph. acét., p. 26, pls. ii., iii. *bis*; pl. viii. figs. 1, 2; pls. xi.–xv.; pl. xxix. fig. 6.
1851. „ „ Vér., Céph. médit., p. 16, pl. viii.
1869. „ *Troscheli (?)*, Targ., Cef. Mus. Firenze, p. 19.

2. *Octopus salutii*, Vérany.

1837. *Octopus Salutii*, Vér., Mem. Accad. Sci. Torino, p. 93, pl. iii.
1851. „ „ Vér., Céph. médit., p. 20, pl. ix.

3. *Octopus occidentalis*, Steenstrup., MS. (p. 77).

... *Octopus occidentalis*, Stp., MS. in Mus. Havn.
1853. „ *vulgaris*, var. *americanus*, d'Orb., Moll. Cuba, p. 14, tab. i.

4. *Octopus tuberculatus*, Blainville (p. 78).

1826. *Octopus tuberculatus*, Blv., Dict. d. Sci. Nat., t. xliii. p. 187.

5. *Octopus verrucosus*, Hoyle (Pl. IV.; p. 79).

1885. *Octopus verrucosus*, Hoyle, Diagnoses I., p. 222.

6. *Octopus granulatus*, Lamarck[1] (p. 80).

1792. *Sepia rugosa*, Bosc, Actes Soc. Hist. Nat. Paris, t. i. p. 24, pl. v. figs. 1, 2.
1799. *Octopus granulatus*, Lmk., Mém. Soc. Hist. Nat. Paris, t. i. p. 20.
1838. „ *rugosus*, d'Orb., Céph. acét., p. 45; Poulpes, pls. vi., xxiii. fig 2.
1869. „ *incertus*, Targ., Cef. Mus. Firenze, p. 22, tav. vi. figs. 9, 11.

7. *Octopus boscii* (Lesueur) (Pl. I., Pl. III. fig. 2; p. 81).

1821. *Sepia Boscii*, Les., Journ. Acad. Nat. Sci. Philad., vol. ii. p. 101.
1826. *Octopus variolatus*, Blv., Dict. d. Sci. Nat., t. xliii. p. 186.
1838. „ *Boscii*, d'Orb., Céph. acét., p. 68.
1849. „ „ Gray, B.M.C., p. 12.
1885. „ „ var. *pallida*, Hoyle, Diagnoses I., p. 223.

8. *Octopus tetricus*, Gould.

1852. *Octopus tetricus*, Gld., Moll. Wilkes Exped., p. 474, fig. 588.

9. *Octopus polyzenia*, Gray.

1849. *Octopus polyzenia*, Gray, B.M.C., p. 13.
1884. „ „ E. A. Sm., "Alert" Rep., p. 34, pl. iv. fig. A.

10. *Octopus tonganus*, Hoyle (Pl. VIII. figs. 1, 2; p. 83).

1885. *Octopus tonganus*, Hoyle, Diagnoses I., p. 225.

11. *Octopus de filippi*, Vérany.

1851. *Octopus De-Filippii*, Vér., Céph. médit., p. 30, pl. xi. figs. D, F.
1869. „ *De Filippi*, Targ., Cef. Mus. Firenze, p. 20.

12. *Octopus vitiensis*, Hoyle (Pl. VII. figs. 6–8; p. 84).

1885. *Octopus vitiensis*, Hoyle, Diagnoses I., p. 226.

13. *Octopus bimaculatus*, Verrill.

1883. *Octopus bimaculatus*, Vll, "Blake" Suppl., p. 121, pl. v. fig. 1; pl. vi.

14. *Octopus marmoratus*, Hoyle (Pl. VI.; p. 85).

1885. *Octopus marmoratus*, Hoyle, Diagnoses I., p. 227.

15. *Octopus areolatus*, de Haan (Pl. III. figs. 6, 7; p. 86).

1835. *Octopus areolatus*, de Haan, MS. (*fide* d'Orb.).
1838. „ „ d'Orb., Céph. acét., p. 65.
1838. „ *sinensis* (?), d'Orb., Céph. acét., p. 68, pl. ix.
1849. „ *ocellatus*, Gray, B.M.C., p. 15.
1886. „ „ Appellöf, Japanska Ceph., p. 8, pl. i. figs. 1, 2, 3.

[1] I have preferred Lamarck's name to that of Bosc, which rests only on a very poor figure.

16. *Octopus superciliosus*, Quoy et Gaimard.

1832. *Octopus superciliosus*, Q. et G., Voy. "Astrolabe," t. ii. p. 88, pl. vi. fig. 4.
1838. „ „ d'Orb., Céph. acét., p. 41; Poulpes, pl. x. fig. 3, pl. xxviii. fig. 6.

17. *Octopus australis*, Hoyle (Pl. III. figs. 4, 5; p. 88).

1885. *Octopus australis*, Hoyle, Diagnoses I., p. 224.

18. *Octopus membranaceus*, Quoy et Gaimard.

1832. *Octopus membranaceus*, Q. et G., Voy. "Astrolabe," t. ii. p. 89, pl. vi. fig. 5.
1882. *Amphioctopus membranaceus*, Fischer, Man. de Conch., p. 333.

19. *Octopus carolinensis*, Verrill.

1884. *Octopus Carolinensis*, Vll., Second Catal., p. 235.
1885. „ „ Vll., Third Catal., pl. xlii. fig. 4.

20. *Octopus horridus*, d'Orbigny.

1826. *Octopus horridus*, d'Orb., Tabl. méth., Ann. d. Sci. Nat., t. vii. p. 144, No. 4.
1838. „ „ d'Orb., Céph. acét., p. 51; Poulpes, pl. vii. fig. 3.
1848. „ *argus*, Krauss, Südafrik. Moll., p. 132, pl. vi. fig. 26.

21. *Octopus aculeatus*, d'Orbigny.

1825. *Octopus aculeatus*, d'Orb., Céph. acét.; Poulpes, pl. vii. (*nomen tantum*).
1838. „ „ d'Orb., Céph. acét., p. 53; Poulpes, pl. vii. figs. 1, 2, pl. viii. fig. 1, pl. xxiii. figs. 3, 4.

22. *Octopus tenebricus*, E. A. Smith.

1884. *Octopus tenebricus*, E. A. Sm., "Alert" Rep., p. 35, pl. iv. fig. B.

23. *Octopus megalocyathus*, Gould.

1852. *Octopus megalocyathus*, Gld., Moll. Wilkes Exped., p. 471, fig. 586.

24. *Octopus fontanianus*, d'Orbigny.

1835. *Octopus fontanianus*, d'Orb., Amér. mérid., p. 28, pl. ii. fig. 5.
1838. „ „ d'Orb., Céph. acét., p. 49; Poulpes, pl. xxviii. fig. 5, pl. xxix. fig. 1.

25. *Octopus tehuelchus*, d'Orbigny (p. 89).

1835. *Octopus tehuelchus*, d'Orb., Amér. mérid., p. 27, pl. i. figs. 6, 7.
1838. „ „ d'Orb., Céph. acét., p. 55; Poulpes, pl. xvii. fig. 6.

26. *Octopus hawaiensis*, Eydoux et Souleyet.

1852. *Octopus hawaiensis*, E. et S., Voy. "Bonite," p. 9, pl. i. figs. 1–5.

27. *Octopus globosus*, Appellöf.

1886. *Octopus globosus*, Appellöf, Japanska Ceph., p. 7, pl. i. figs. 4, 5.

28. *Octopus duplex*, Hoyle (Pl. VII. fig. 5 ; p. 90).

1885. *Octopus duplex*, Hoyle, Diagnoses I., p. 226.

29. *Octopus lentus*, Verrill.

1880. *Octopus lentus*, Vll., Amer. Journ. Sci. and Arts, vol. xix. p. 138.
1881. „ „ Vll., Ceph. N. E. Amer., p. 375, pl. xxxv. figs. 1, 2 ; pl. li. fig. 2.

30. *Octopus obesus*, Verrill.

1880. *Octopus obesus*, Vll., Amer. Journ. Sci. and Arts, vol. xix. pp. 137, 294.
1881. „ „ Vll., Ceph. N. E. Amer., p. 379, pl. xxxvi. fig. 3.

31. *Octopus furvus*, Gould.

1852. *Octopus furvus*, Gld., Moll. Wilkes Exped., p. 475, fig. 589.

32. *Octopus piscatorum*, Verrill (p. 91).

1879. *Octopus piscatorum*, Vll., Amer. Journ. Sci. and Arts, vol. xviii. p. 470.
1881. „ „ Vll., Ceph. N. E. Amer., p. 377, pl. xxxvi. figs. 1, 2.
1885. „ „ Vll., Third Catal., pl. xlii. fig. 5.

33. *Octopus arcticus*, Prosch (p. 91).

1834. *Sepia gröenlandica* (*?*), Dewh., Nat. Hist. Cetacea, p. 263.
1849. *Octopus arcticus*, Prosch, K. dansk. Vidensk. Selsk. Skriv., Rk. 5, Bd. i. p. 53, figs. 1–3.
1856. „ „ Stp., Hectocotyl., p. 201, Tav. ii. fig. 2.
1873. „ *Bairdii*, Vll., Amer. Journ. Sci. and Arts, vol. v. p. 5.
1878. „ „ Sars, Moll. Reg. Arct. Norv., p. 339, pl. xxxiii. figs. 1–10.
1881. „ „ Vll., Ceph. N. E. Amer., pp. 368, 421, pl. xxxiii. fig. 1; pl. xxxiv. figs. 5, 6; pl. xxxvi. fig. 10; pl. xxxviii. fig. 8; pl. xlix. fig. 4; pl. li. fig. 1.

34. *Octopus verrilli*, n. n.[1]

1883. *Octopus pictus*, Vll., "Blake" Suppl., p. 112, pl. iii. fig. 3.

35. *Octopus pictus*, Brock (Pl. VIII. fig. 3 ; p. 92).

1882. *Octopus pictus*, Brock, Zeitschr. f. wiss. Zool., Bd. xxxvi. p. 603, Taf. xxxvii. fig. 3.
1883. „ *maculosus*, Hoyle, Proc. Roy. Phys. Soc. Edin., vol. vii. p. 319, pl. vi.
1884. „ „ E. A. Sm., "Alert" Rep., p. 36, pl. iv. fig. c.

36. *Octopus lunulatus*, Quoy et Gaimard.

1832. *Octopus lunulatus*, Q. et G., Voy. "Astrolabe," t. ii. p. 86, pl. vi. figs. 1, 2.
1838. „ „ d'Orb., Céph. acét., p. 59 ; Poulpes, pl. x. fig. 2, pl. xxvi. figs. 5–7.

37. *Octopus aranea*, d'Orbigny.

1826. *Octopus aranea*, d'Orb., Céph. acét.; Poulpes, pl. v. (*nomen tantum*).
1838. „ „ d'Orb., Céph. acét., p. 57; Poulpes, pl. v.

[1] Verrill's name having been preoccupied by Brock, I take the liberty of re-naming the species after its original describer, who has made us acquainted with so many interesting Cephalopods.

38. *Octopus bermudensis*, Hoyle (Pl. II. fig. 5 ; p. 94).

1885. *Octopus bermudensis*, Hoyle, Diagnoses I., p. 228.

39. *Octopus macropus*, Risso[1] (p. 95).

1826. *Octopus macropus*, Risso, Hist. Nat. Eur. mérid., t. iv. p. 3.
1826. „ *Cuvierii*, d'Orb., Céph. acét.; Poulpes, pl. iv. (*nomen tantum*).
1838. „ *Cuvieri*, d'Orb., Céph. acét., p. 18 ; Poulpes, pls. i., iv., xxiv., xxvii.
1851. „ *macropus*, Vér., Céph. médit., p. 27, pl. x.
1869. „ „ Targ., Cef. Mus. Firenze, p. 23.
1869. „ *Cuvieri*, Targ., *Ibid.* p. 24.
1886. „ „ Appellöf, Japanska Céph., p. 6, pl. i. fig. 6.

40. *Octopus ornatus*, Gould.

1852. *Octopus ornatus*, Gld., Moll. Wilkes Exped., p. 476, fig. 590.

41. *Octopus gracilis*, Verrill.

1884. *Octopus gracilis*, Vll., Second Catal., p. 236.

42. *Octopus bandensis*, Hoyle (Pl. VII. figs. 9, 10 ; p. 96).

1885. *Octopus bandensis*, Hoyle, Diagnoses I., p. 227.

43. *Octopus januarii*, Steenstrup, MS. (Pl. VII. figs. 1–4 ; p. 97).

1885. *Octopus januarii*, Hoyle, Diagnoses I., p. 229.

44. *Octopus levis*, Hoyle (Pl. II. figs. 1–4 ; Pl. III. fig. 1 ; p. 98).

1885. *Octopus levis*, Hoyle, Diagnoses I., p. 229.

45. *Octopus punctatus*, Gabb (Pl. V.; p. 100).

1862. *Octopus punctatus*, Gabb, Proc. Calif. Acad., vol. ii. p. 170.
1883. „ „ Vll., "Blake" Suppl., p. 117, pl. iv.; pl. v. fig. 2.
1885. *Octopus honkongensis*, Hoyle, Diagnoses I., p. 224.

46. *Octopus filosus*, Howell.

1867. *Octopus filosa*, Howell, Amer. Journ. Conch., vol. iii. p. 240, pl. xiv.

47. *Octopus alderii*, Vérany.

1851. *Octopus Alderii*, Vér., Céph. médit., p. 32, pl. vii. *bis*, fig. 3.

(Species insufficiently characterised.)

48. *Octopus brevipes*, d'Orbigny.

1838. *Octopus brevipes*, d'Orb., Céph. acét., p. 61 ; Poulpes, pl. xvii. fig. 1.

[1] I do not feel certain that this species and *Octopus cuvieri* are really the same. D'Orbigny places them together under the name *Octopus cuvieri*, and Vérany regards them as identical, but prefers the name *Octopus macropus*. Targioni-Tozzetti separates them, and Dr. Jatta unites them. Professor Steenstrup informs me that he is not convinced of their identity.

49. *Octopus capensis*, Eydoux et Souleyet.

1852. *Octopus capensis*, E. et S., Voy. "Bonite," p. 11, pl. i. figs. 6, 7.

50. *Octopus ægina*, Gray.

1849. *Octopus Ægina*, Gray, B.M.C., p. 7.

51. *Octopus cassiopea*, Gray.

1849. *Octopus Cassiopea*, Gray, B.M.C., p. 9.

52. *Octopus cephea*, Gray.

1849. *Octopus Cephea*, Gray, B.M.C., p. 15.

53. *Octopus cyanea*, Gray.

1849. *Octopus Cyanea*, Gray, B.M.C., p. 15.

54. *Octopus eudora*, Gray.

1849. *Octopus Eudora*, Gray, B.M.C., p. 9.

55. *Octopus favonia*, Gray.

1849. *Octopus favonia*, Gray, B.M.C., p. 9.

56. *Octopus geryonea*, Gray.

1849. *Octopus Geryonea*, Gray, B.M.C., p. 7.

57. *Octopus medoria*, Gray.

1849. *Octopus medoria*, Gray, B.M.C., p. 14.

58. *Octopus berenice*, Gray.

1849. *Octopus Berenice*, Gray, B.M.C., p. 11.

59. *Octopus saphenia*, Gray.

1849. *Octopus Saphenia*, Gray, B.M.C., p. 11.

60. *Octopus hardwickei*, Gray.

1849. *Octopus Hardwickei*, Gray, B.M.C., p. 8.

61. *Octopus pusillus*, Gould.

1852. *Octopus pusillus*, Gld., Moll. Wilkes Exped., p. 478, fig 591.

62. *Octopus mollis*, Gould.

1852. *Octopus mollis*, Gld., Moll. Wilkes Exped., p. 479, fig. 592.

63. *Octopus mimus*, Gould.

1852. *Octopus mimus*, Gld., Moll. Wilkes Exped., p. 473, fig. 587.

64. *Octopus maorum*, Hutton.

1880. *Octopus maorum*, Hutton, Manual N. Zeal. Moll., p. 1.
1882. „ „ Hutton, Trans. N. Zeal. Inst., vol. xiv. p. 162, pl. vi. fig. A (*dentition*).
1885. „ „ Parker, Nature, vol. xxxii. p. 586.

65. *Octopus communis*, Park.

1885. *Octopus communis*, Park, Trans. N. Zeal. Inst., vol. xvii. p. 198.

66. *Octopus harmandi*, de Rochebrune.

1882. *Octopus Harmandi*, Rochebr., Bull. soc. philom. Paris, sér. 7, t. vi. p. 73.

67. *Octopus pilosus*, Risso.

1826. *Octopus pilosus*, Risso, Hist. Nat. Eur. mérid., t. iv. p. 4.

68. *Octopus peronii* (Lesueur), d'Orbigny.

1821. *Sepia Peronii*, Les., Journ. Acad. Nat. Sci. Philad., vol. ii. p. 101.
1845. *Octopus Peronii*, d'Orb., Moll. viv., p. 185.

69. *Octopus longipes*, Leach.

1817. *Octopus longipes*, Leach, Zool. Miscell., vol. iii. p. 139.

70. *Octopus granosus*, Blainville.

1826. *Octopus granosus*, Blv., Dict. d. Sci. Nat., t. xliii. p. 186.

71. *Octopus fimbriatus*, Rüppell, MS.

1838. *Octopus fimbriatus*, d'Orb., Céph. acét., p. 64.

72. *Octopus fang-siao*, d'Orbigny.

1838. *Octopus fang-siao*, d'Orb., Céph. acét., p. 70.

73. *Octopus cærulescens*, Péron.

1826. *Octopus cærulescens*, Blv., Dict. d. Sci. Nat., t. xliii. p. 189.

74. *Octopus didynamus*, Rafinesque.

1814. *Octopus didynamus*, Raf., Précis découv. somiol., p. 28.

75. *Octopus tetradynamus*, Rafinesque.

1814. *Octopus tetradynamus*, Raf., Précis découv. somiol., p. 28.

76. *Octopus frayedus*, Rafinesque.

1814. *Octopus frayedus*, Raf., Précis découv. somiol., p. 28.

77. *Octopus heteropus*, Rafinesque.

Octopus heteropus, Raf., Précis découv. somiol., p. 28.

Subgenus *Tritaxeopus*, Owen, 1881.

78. *Octopus cornutus* (Owen).

1881. *Tritaxeopus cornutus*, Owen, Trans. Zool. Soc. Lond., vol. xi., part 5, p. 131, pl. xxiii.

Pinnoctopus, d'Orbigny, 1845.

1. *Pinnoctopus cordiformis* (Quoy et Gaimard), d'Orbigny.

1832. *Octopus cordiformis*, Q. et G., Voy. "Astrolabe," t. ii. p. 87, pl. vi. fig. 3.
1845. *Pinnoctopus cordiformis*, d'Orb., Moll. viv., p. 193, pl. ii.

Cistopus, Gray, 1849.

1. *Cistopus indicus* (Rapp, MS.), Gray.[1]

1838. *Octopus indicus*, d'Orb., Céph. acét., p. 24; Poulpes, pl. xxv., pl. xxvi. figs. 1–4.
1849. *Cistopus indicus*, Gray, B.M.C., p. 20.

Scæurgus, Troschel, 1857.

1. *Scæurgus titanotus*, Troschel.

1857. *Scæurgus titanotus*, Trosch., Archiv f. Naturgesch., Jahrg. xxiii. Bd. i. p. 51, Taf. iv. figs. 4, 5.
1858. „ „ Trosch., *Op. cit.*, Jahrg. xxiv. Bd. i. p. 298.

2. *Scæurgus unicirrhus* (delle Chiaje, MS.), Tiberi.[2]

1838. *Octopus unicirrhus*, d'Orb., Céph. acét., p. 70.
1851. „ *Cocco*, Vér., Céph. médit., p. 22, pls. xii., xii. *bis*.
1857. *Scæurgus Coccoi*, Trosch., Archiv f. Naturgesch., Jahrg. xxiii. Bd. i. p. 57, Taf. iv. fig. 6.
1880. „ *unicirrhus*, Tiberi, Bull. soc. mal. ital., vol. vi. p. 12.

3. *Scæurgus tetracirrhus* (delle Chiaje, MS.), Tiberi.

1838. *Octopus tetracirrhus*, d'Orb., Céph. acét., p. 36; Poulpes, pl. xxii.
1851. „ „ Vér., Céph. médit., p. 25, pl. vii. *bis*, figs. 1, 2.
1880. *Scæurgus tetracirrhus*, Tiberi, Bull. mal. ital., vol. iv. p. 12.
1882. *Pteroctopus tetracirrhus*, Fischer, Man. de Conch., p. 334.

[1] Just at the time of going to press Professor Steenstrup writes me that it is, in his opinion, very doubtful whether d'Orbigny's two figures represent the same species. He is disposed to regard the type of Rapp's species as having been a true *Octopus*, and for the form with pouches between the arms he has adopted the name *Cistopus bursarius*.

[2] Vérany (*loc. cit.*, p. 24) admits that his *Octopus cocco* is identical with delle Chiaje's *Octopus unicirrhus*, and also recognises the priority of the latter, under which circumstances there can be no doubt that the name has been rightly restored by Dr. Tiberi. D'Orbigny regarded it as a synonym of *Octopus vulgaris*.

Eledone, Leach, 1817.

Ozoena, Rafinesque.

1. *Eledone moschata* (Lamarck), Leach.

1799. *Octopus moschatus*, Lmk., Mém. Soc. Hist. Nat. Paris, t. i. p. 22, pl. ii.
1817. *Eledone moschata*, Leach, Zool. Miscell., vol. iii. p. 138.
1838. „ „ d'Orb., Céph. acét., p. 72; Elédons, pls. i., i. *bis*, pl. iii.
1851. „ *moschatus*, Vér., Céph. médit., p. 7, pls. iv.–vi.

2. *Eledone cirrosa* (Lamarck), d'Orbigny (p. 102).

1776. *Sepia octopodia* (*?*), Pennant, Brit. Zool., vol. iv. p. 53, pl. xxviii. fig. 44.
1799. *Octopus cirrhosus*, Lmk., Mém. Soc. Hist. Nat. Paris, t. i. p. 21, pl. i. fig. 2.
1814. *Ozoena Aldrovandi*, Raf., Précis découv. somiol., p. 29.
1827. *Octopus ventricosus*, Grant, Edin. N. Phil. Journ., p. 309.
1838. *Eledone cirrhosus*, d'Orb., Céph. acét., p. 79; Elédons, pl. ii.
1843. „ *Pennantii*, Macgillivray, Moll. Anim. Scot., p. 31.
1843. „ *Aldrovandi*, Macgillivray, *Ibid.*, p. 32.
1851. „ *Aldrovandi*, Vér., Céph. médit., p. 12, pls. ii., iii.
1851. „ *Genei*, Vér., *Op. cit.*, p. 15, pl. i.

3. *Eledone verrucosa*, Verrill (p. 104).

1881. *Eledone verrucosa*, Vll., "Blake" Rep., p. 105, pls. v., vi.
1881. „ „ Vll., Ceph. N. E. Amer., p. 380, pls. lii., liii.

4. *Eledone rotunda*, Hoylé (Pl. VIII. figs. 4–6; p. 104).

1885. *Eledone rotunda*, Hoyle, Diagnoses I., p. 230.

5. *Eledone brevis*, Hoyle (Pl. VIII. fig. 7; p. 105).

1885. *Eledone brevis*, Hoyle, Diagnoses I., p. 230.

6. *Eledone halliana*, de Rochebrune.

1884. *Eledona halliana*, Rochebr., Monogr. Eledonidæ, p. 162.

Hoylea, de Rochebrune, 1886.

Hallia, Val., MS.

1. *Hoylea sepioidea* (Valenciennes, MS.) de Rochebrune.

1884. *Hallia sepioidea*, Rochebr., Monogr. Eledonidæ, p. 156, pl. vii.
1886. *Hoylea sepioidea*, Rochebr., Bull. soc. philom. Paris, sér. 7, t. ix. p. 85.

Eledonenta, de Rochebrune, 1884.

1. *Eledonenta filholiana*, de Rochebrune.

1884. *Eledonenta Filholiana*, Rochebr., Monogr. Eledonidæ, p. 157.

2. *Eledonenta microsicya*, de Rochebrune.

1884. *Eledonenta microsicya*, Rochebr., Monogr. Eledonidæ, p. 158.

Eledonella, Verrill, 1884.

Japetella, Hoyle (*pars*).

1. *Eledonella pygmæa*, Verrill.

1884. *Eledonella pygmæa*, Vll., Second Catal., p. 145, pl. xxxii. fig. 2.

2. *Eledonella diaphana*, Hoyle (Pl. IX. figs. 3–6; p. 107).

1885. *Japetella diaphana*, Hoyle, Diagnoses I., p. 232.

Japetella, Hoyle, 1885.

1. *Japetella prismatica*, Hoyle (Pl. IX. figs. 1, 2; p. 109).

1885. *Japetella prismatica*, Hoyle, Diagnoses I., p. 231.

Bolitæna, Steenstrup, 1859.

1. *Bolitæna microcotyla*, Steenstrup, MS.[1]

1859. *Bolitæna* sp., Stp., Vid. Meddel. nat. Foren. Kjøbenhavn, Aar 1858, p. 183.

Suborder II. DECAPODA, Leach, 1818.

Division I. MYOPSIDA, d'Orbigny, 1845.

Family VII. Sepiolini, Steenstrup, 1861.

Sepiola (Rondelet, 1554), Leach, 1817.

1. *Sepiola rondeleti*, Leach (p. 110).

1558. *Sepiola Rondeleti*, Gesner, De Aquat., lib. iv. p. 855.
1817. „ *Rondeletii*, Leach, Zool. Miscell., vol. iii. p. 140.
1839. „ „ d'Orb., Céph. acét., p. 230; Sépioles, pl. i. figs. 1–6, pl. ii. figs. 3–13, pl. iii. figs. 6–9.
1845. „ *oceanica*, d'Orb., Moll. viv., pl. x. fig. 13 (*err.*).
1869. „ *major* (?), Targ., Cef. Mus. Firenze, p. 45.

[1] *Bolitæna microcotyla* has a soft ovoid body of gelatinous consistency, and a reddish-purple colour, somewhat resembling *Cirroteuthis*, but destitute of fins and with the mantle-opening very wide, extending beyond the eyes instead of being a narrow aperture immediately surrounding the funnel. The arms are comparatively short and slender, webbed almost up to the extremities, and provided with a single row of very small suckers. The jaws are very little curved, and the radula is remarkable in that the rows of teeth present a serial repetition, the fifth resembling the first.

2. *Sepiola oweniana*, d'Orbigny.

1839. *Sepiola Oweniana*, d'Orb., Céph. acét., p. 229; Sépioles, pl. iii. figs. 1–5.
1867. „ „ (?) Mörch, Vid. Meddel. nat. Foren. Kjøbenhavn, p. 101.
1879. „ „ (?) Tryon, Man. Conch., vol. i. p. 156 (*habitat*).

3. *Sepiola pacifica*, Kirk.

1882. *Sepiola pacifica*, Kirk, Trans. N. Zeal. Inst., vol. xiv. p. 283.

4. *Sepiola atlantica*, d'Orbigny.

1839. *Sepiola atlantica*, d'Orb., Céph. acét., p. 235; Sépioles, pl. iv. figs. 1–12.

5. *Sepiola stenodactyla*, Grant.

1833. *Sepiola stenodactyla*, Grant, Trans. Zool. Soc. Lond., vol. i. p. 84, pl. ii. figs. 1, 2.

6. *Sepiola pusilla*, Pfeffer.[1]

1884. *Sepiola pusilla*, Pffr., Ceph. Hamb. Mus., p. 7, fig. 9.

7. *Sepiola schneehageni*, Pfeffer.[1]

1884. *Sepiola Schneehageni*, Pffr., Ceph. Hamb. Mus., p. 7, fig. 8.

8. *Sepiola tasmanica*, Pfeffer.[1]

1884. *Sepiola tasmanica*, Pffr., Ceph. Hamb. Mus., p. 6., fig. 7.

9. *Sepiola rossiæformis*, Pfeffer.

1884. *Sepiola rossiæformis*, Pffr., Ceph. Hamb. Mus., p. 8, fig. 10.

10. *Sepiola penares* (Gray), Tryon.

1849. *Fidenas penares*, Gray, B.M.C., p. 95.
1858. „ „ Adams, Gen. Rec. Moll., p. 41, pl. v. fig. 1.
1879. *Sepiola penares*, Tryon, Man. Conch., vol. i. p. 157.

Inioteuthis, Verrill, 1881.

1. *Inioteuthis japonica* (Tilesius, MS.), Verrill.

1839. *Sepiola Japonica*, d'Orb., Céph. acét., p. 234.
1881. *Inioteuthis Japonica*, Vll., Ceph. N. E. Amer., p. 417.

2. *Inioteuthis morsei*, Verrill (Pl. XIV. figs. 1–9; p. 112).

1881. *Inioteuthis Morsei*, Vll., Ceph. N. E. Amer., p. 417.
1884. *Sepiola bursa* (?), Pffr., Ceph. Hamb. Mus., p. 6, fig. 6.
1886. *Inioteuthis Morsei*, Appellöf, Japanska Ceph., p. 15, pl. ii. figs. 15, 16; pl. iii. figs. 16, 19, 20, 23.

[1] From the absence of the pen in these three species, I am inclined to suspect that some of them should be referred to Verrill's genus *Inioteuthis*; possibly the same is the case with *Sepiola stenodactyla* (see p. 114).

Stoloteuthis, Verrill, 1881.

1. *Stoloteuthis leucoptera*, Verrill.

1878. *Sepiola leucoptera*, Vll., Amer. Journ. Sci. and Arts, vol. xvi. p. 378.
1881. *Stoloteuthis leucoptera*, Vll., Ceph. N. E. Amer., pp. 347, 418, pl. xxxi. figs. 4, 5; pl. liv. fig. 4.

Nectoteuthis, Verrill, 1883.

1. *Nectoteuthis pourtalesii*, Verrill.

1883. *Nectoteuthis Pourtalesii*, Vll., "Blake" Suppl., p. 108, pl. iii. fig. 1.

Rossia, Owen, 1834.

1. *Rossia palpebrosa*, Owen.

1834. *Rossia palpebrosa*, Owen, Ross' Second Arctic Voy., Nat. Hist., p. 93. pl. B, fig. 1; pl. C.

2. *Rossia macrosoma* (delle Chiaje), d'Orbigny.

1829. *Sepiola macrosoma*, d. Ch., Mem. stor. anim., t. lxxi. (*fide* Gerv. et v. Ben.).
1839. „ „ Gerv. et v. Ben., Bull. Acad. Sci. Bruxelles, t. vi. p. 39.
1839. *Rossia macrosoma*, d'Orb., Céph. acét., p. 245; Sépioles, pl. iv. figs. 13–24.
1869. „ *Panceri*, Targ., Cef. Mus. Firenze, p. 46, pl. vii. fig. 7 (♂).

3. *Rossia oweni*, Ball (Pl. XV. figs. 1–9; p. 114).

1842. *Rossia Owenii*, Ball, Proc. Roy. Irish Acad., vol. ii. p. 193 (♂).
1842. „ *Jacobi*, Ball, *Op. cit.*, p. 193 (♀).
1845. „ *Owenii*, Lovén, Öfversigt k. Vetensk.-Akad. Förhandl., p. 121.
1853. „ „ Forbes and Hanley, Brit. Moll., vol. iv. p. 223, pl. sss, fig. 1.

4. *Rossia glaucopis*, Lovén (p. 116).

1845. *Rossia glaucopis*, Lovén, Öfversigt. k. Vetensk.-Akad. Förhandl., p. 121.
1869. „ *papillifera*, Jeffreys, Brit. Conch., vol. v. p. 134.
1878. „ *glaucopis*, Sars, Moll. Reg. Arct. Norv., p. 337, pl. xxxii.

5. *Rossia hyatti*, Verrill.

1878. *Rossia Hyatti*, Vll., Amer. Journ. Sci. and Arts, vol. xvi. p. 208.
1881. „ „ Vll., Ceph. N. E. Amer., p. 351, pl. xxvii. figs. 8, 9; pl. xxx. fig. 1; pl. xxxi. figs. 1, 2; pl. xlvi. fig. 5.

6. *Rossia sublevis*, Verrill (p. 117).

1878. *Rossia sublævis*, Vll., Amer. Journ. Sci. and Arts, vol. xvi. p. 209.
1881. „ *sublevis*, Vll., Ceph. N. E. Amer., pp. 354, 419, pl. xxx. fig. 2; pl. xxxi. fig. 3; pl. xlvi. fig. 4; pl. xlvii. figs. 2–4.

7. *Rossia brachyura*, Verrill.

1883. *Rossia brachyura*, Vll., "Blake" Suppl., p. 110, pl. iii. fig. 2.

8. *Rossia mölleri*, Steenstrup.

1856. *Rossia Mölleri*, Stp., Hectocotyl., p. 198, pl. ii. fig. 1.

9. *Rossia tenera* (Verrill) (p. 118).

1880. *Heteroteuthis tenera*, Vll., Amer. Journ. Sci. and Arts., vol. xx. p. 392.
1881. „ „ Vll., Ceph. N. E. Amer., p. 357, pl. xlvi. figs. 2, 3; pl. xlvii. fig. 5.
1883. „ „ Vll., "Blake" Suppl., p. 111.

10. *Rossia patagonica*, E. A. Smith (Pl. XV. figs. 10–18 ; p. 119).

1881. *Rossia patagonica*, E. A. Sm., Proc. Zool. Soc. Lond., p. 22, pl. iii. fig. 3.

11. *Rossia megaptera*, Verrill.

1881. *Rossia megaptera*, Vll., Ceph. N. E. Amer., p. 349, pl. xxxviii. fig. 1; pl. xlvi. fig. 6.

Heteroteuthis, Gray, 1849 (*non* Verrill).

Rossia, Vérany et Auctt. (*pars*).

1. *Heteroteuthis dispar* (Rüppell), Gray.

1845. *Sepiola dispar*, Rüpp., Giorn. Gab. Messina, t. xxvi (*fide* Vér.)
1849. *Rossia* (*Heteroteuthis*) *dispar*, Gray, B.M.C., p. 90.
1851. „ *dispar*, Vér., Céph. médit., p. 63, pl. xxiii. figs. *d–h*.
1857. „ „ Trosch., Archiv f. Naturgesch., Jahrg. xxiii. Bd. i. p. 62, pl. iv. figs. 7, 8.
1858. „ „ Claus, *Op. cit.*, Jahrg. xxiv. Bd. i. p. 259, Taf. x. fig. 5.

Promachoteuthis, Hoyle, 1885.

1. *Promachoteuthis megaptera*, Hoyle (Pl. XIV. figs. 10–14 ; p. 120).

1885. *Promachoteuthis megaptera*, Hoyle, Narr. Chall. Exp., vol. i. p. 273, fig. 109.
1885. „ „ Hoyle, Diagnoses II., p. 182.

Family VIII. Sepiarii, Steenstrup, 1861.

Sepidæ, d'Orb. (*pars*).

Subfamily, Sepiadarii, Steenstrup, 1881.

Sepioloidea, d'Orbigny, 1839.

1. *Sepioloidea lineolata* (Quoy et Gaimard), d'Orbigny.

1832. *Sepiola lineolata*, Q. et G., Voy. "Astrolabe," t. ii. p. 82, pl. v. figs. 8–13.
1839. *Sepioloidea lineata*, d'Orb., Céph. acét., p. 240; Sépioles, pl. iii. figs. 10–18.
1881. „ „ Stp., Sepiadarium og Idiosepius, p. 233.
1884. „ „ Brock, Zeitschr. f. Wiss. Zool., Bd. xl. pp. 105–120.

Sepiadarium, Steenstrup, 1881.

1. *Sepiadarium kochii*, Steenstrup.

1881. *Sepiadarium Kochii*, Stp., Sepiadarium og Idiosepius, p. 214, pl. i. figs. 1–10.

Subfamily Idiosepii, Steenstrup, 1881.

Idiosepius, Steenstrup, 1881.

1. *Idiosepius pygmæus*, Steenstrup.[1]

1881. *Idiosepius pygmæus*, Stp., Sepiadarium og Idiosepius, p. 219, pl. i. figs. 11–22.

Spirula, Lamarck, 1801.[2]

1. *Spirula peronii*, Lamarck (p. 122).

1822. *Spirula Peronii*, Lmk., Anim. s. vert., t. vii. p. 601.

Subfamily Eusepii, Steenstrup, 1881.

Sepia, Linné, 1766.

Rhombosepion, *Lophosepion*,
Spathidosepion, *Doratosepion*, } de Rochebrune.[3]
Ascarosepion, *Acanthosepion*,

1. *Sepia officinalis*, Linné.

1761. *Sepia officinalis*, Linn., Fauna Suecica, No. 2106.
1839. „ „ d'Orb., Céph. acét., p. 260; Seiches, pl. i., pl. ii. figs. 4, 5, pl. iii. figs. 1–3, pl. xvii. figs. 1, 2.

2. *Sepia filliouxii*, Lafont.

1839. *Sepia officinalis*, d'Orb., Céph. acét.,; Seiches, pl. ii. figs. 1, 2, 3.
1851. „ „ Vér., Céph. médit., pl. xxv.
1868. „ *Filliouxii*, Lafont, Bull. Assoc. Sci. Franc., No. 81 (*fide* Laf.).
1869. „ „ Lafont, Journ. de Conch., sér. 3, t. ix. p. 11.

[1] Steenstrup (*op. cit.*, p. 224) suggests the possibility that *Cranchia minima*, Fér., and *Loligopsis peronii*, Lmk., may be allied to this form.

[2] There are great differences of opinion as to the number of species that should be referred to this genus, and there seems to be as little agreement regarding the names which they should bear; under these circumstances I refrain from giving any opinion, but content myself with placing one species on the list, and using the name adopted by Prof. Huxley in his Report on the genus to be published in the present series.

[3] Dr. de Rochebrune has recently published a memoir (*Bull. Soc. philom. Paris*, sér. 7, t. viii. pp. 74–122, pls. iii.–vi.) in which he has divided the *Sepia* of previous authors into a number of new genera; most of these seem to me to be at most of subgeneric value, and there are so many points in which I find myself unable to follow Dr. de Rochebrune that I have only given references to his paper in the case of his new species.

3. *Sepia myrsus*, Gray.

1849. *Sepia myrsus*, Gray, B.M.C., p. 108.

4. *Sepia fischeri*, Lafont.

1871. *Sepia fischeri*, Lafont, Actes Linn. Soc. Bordeaux, t. xxviii. p. 271.

5. *Sepia hierredda*, Rang.

1837. *Sepia hierredda*, Rang, Mag. de Zool., ann. vii., cl. v. p. 75, pl. c.
1839. „ *Hierredda*, d'Orb., Céph. acét., p. 268 ; Seiches, pls. xiii., xviii.
1875. „ *hieredda*, Stp., Hemisepius, p. 478, pl. ii. fig. 2.

6. *Sepia vicellius*, Gray.

1849. *Sepia Vicellius*, Gray, B.M.C., p. 100.

7. *Sepia savignyi*, Blainville.

1827. *Sepia officinalis*, Aud., Expl. pl. Hist. Nat. Egypte, pl. v.; pl. i. fig. 3 (*fide* d'Orb.).
1827. „ *Savignyi*, Blv., Dict. d. Sci. Nat., t. xlviii. p. 285.
1839. „ „ d'Orb., Céph. acét., p. 268 ; Seiches, pls. xiii., xviii.

8. *Sepia smithi*, Hoyle (Pl. XVI. figs. 1–12 ; p. 124).

1885. *Sepia Smithi*, Hoyle, Diagnoses II., p. 190.

9. *Sepia papuensis*, Hoyle (Pl. XVI. figs. 13–23 ; p. 126).

1885. *Sepia papuensis*, Hoyle, Diagnoses II., p. 197.

10. *Sepia pagenstecheri*, Pfeffer.

1884. *Sepia Pagenstecheri*, Pffr., Ceph. Hamb. Mus., p. 9, fig. 12.

11. *Sepia plangon*, Gray.

1849. *Sepia plangon*, Gray, B.M.C., p. 104.

12. *Sepia singaporensis*, Pfeffer.

1884. *Sepia singaporensis*, Pffr., Ceph. Hamb. Mus., p. 10, fig. 13.

13. *Sepia polynesica*, Pfeffer.

1884. *Sepia polynesica*, Pffr., Ceph. Hamb. Mus., p. 11, fig. 14.

14. *Sepia bertheloti*, d'Orbigny.

1839. *Sepia Bertheloti*, d'Orb., Moll. Canaries, p. 21.
1839. „ „ d'Orb., Céph. acét., p. 214 ; Seiches, pls. xi., xxiii.

15. *Sepia verreauxi* (de Rochebrune).

1884. *Ascarosepion Verreauxi*, Rochebr., Monogr. Sepiadæ, p. 98.

16. *Sepia vermiculata*, Quoy et Gaimard.

1832. *Sepia vermiculata*, Q. et G., Voy. "Astrolabe," t. ii. p. 64, pl. i. figs. 1–5.
1839. „ „ d'Orb., Céph. acét., p. 279; Seiches, pl. iii. *bis*.

17. *Sepia latimanus*, Quoy et Gaimard.

1832. *Sepia latimanus*, Q. et G., Voy. "Astrolabe," t. ii. p. 68, pl. ii. figs. 2–11.
1839. „ „ d'Orb., Céph. acét., p. 283; Seiches, pl. xii. figs. 1–6, pl. xvii. figs. 16, 17.

18. *Sepia esculenta*, Hoyle (Pl. XVII. figs. 1–5; Pl. XVIII. figs. 1–6; p. 129).

1885. *Sepia esculenta*, Hoyle, Diagnoses II., p. 188.

19. *Sepia aculeata*, van Hasselt, MS.

1839. *Sepia aculeata*, d'Orb., Céph. acét., p. 287; Seiches, pl. v. *bis*; pl. xxv.
1875. „ „ Stp., Hemisepius, pl. ii. fig. 4.
1884. *Acanthosepion Hasselti*, Rochebr., Monogr. Sepiadæ, p. 101.

20. *Sepia indica*, d'Orbigny.

1839. *Sepia indica*, d'Orb., Céph. acét., p. 288; Seiches, pl. xxi. (*nomine Sepia Blainvillei*).

21. *Sepia zanzibarica*, Pfeffer.

1884. *Sepia zanzibarica*, Pffr., Ceph. Hamb. Mus., p. 9, fig. 11.

22. *Sepia rostrata*, d'Orbigny.

1839. *Sepia rostrata*, d'Orb., Céph. acét., p. 284; Seiches, pl. viii. fig. 6, pl. xxvi.
1884. *Acanthosepion spinigerum*, Rochebr., Monogr. Sepiadæ, p. 103.

23. *Sepia rouxii*, d'Orbigny.

1831. *Sepia Pharaonis* (*?*), Ehrbg., Symb. Phys., An. Moll. Ceph., Sep. No. 1.
1839. „ *Rouxii*, d'Orb., Céph. acét., p. 271; Seiches, pl. xix.

24. *Sepia elliptica*, Hoyle (Pl. XIX. figs. 14–24; p. 131).

1885. *Sepia elliptica*, Hoyle, Diagnoses II., p. 189.

25. *Sepia brevimana*, Steenstrup.

1875. *Sepia brevimana*, Stp., Hemisepius, pp. 475, 479.

26. *Sepia australis*, d'Orbigny.

1839. *Sepia australis*, d'Orb., Céph. acét., p. 285; Seiches, pl. vii. fig. 4.

27. *Sepia venusta*, Pfeffer.

1884. *Sepia venusta*, Pffr., Ceph. Hamb. Mus., p. 12, fig. 15.

28. *Sepia orbignyana*, Férussac.

1826. *Sepia Orbigniana*, d'Orb., Tabl. méth., Ann. d. Sci. Nat. t. vii. p. 156.
1839. „ *Orbignyana*, d'Orb., Céph. acét., p. 273; Seiches, pl. v. figs. 1, 2.

29. *Sepia mestus*, Gray.

1849. *Sepia mestus*, Gray, B.M.C., p. 108.

30. *Sepia cultrata*, Steenstrup, MS. (Pl. XX.; p. 133).

1885. *Sepia cultrata*, Hoyle, Diagnoses II., p. 198.

31. *Sepia trygonina* (de Rochebrune).

1884. *Doratosepion trygoninum*, Rochebr., Monogr. Sepiadæ, p. 97.

32. *Sepia recurvirostra*, Steenstrup (p. 137).

1875. *Sepia recurvirostra*, Stp., Hemisepius, pp. 475, 479.

33. *Sepia sulcata*, Hoyle (Pl. XIX. figs. 1–13; p. 137).

1885. *Sepia sulcata*, Hoyle, Diagnoses II., p. 192.

34. *Sepia andreana*, Steenstrup.

1875. *Sepia andreana*, Stp., Hemisepius, pp. 474, 479, pl. i. figs. 11–19.

35. *Sepia andreanoides*, Hoyle (Pl. XXI. figs. 11–19; Pl. XXII. fig. 11; p. 139).

1885. *Sepia andreanoides*, Hoyle, Diagnoses II., p. 193.

36. *Sepia peterseni*, Appellöf.

1886. *Sepia Peterseni*, Appellöf, Japanska Ceph., p. 23, pl. ii. figs. 1–6; pl. iii. fig. 21.

37. *Sepia kiensis*, Hoyle (Pl. XVII. figs. 6–11; p. 141).

1885. *Sepia kiensis*, Hoyle, Diagnoses II., p. 194.

38. *Sepia kobiensis*, Hoyle (Pl. XVIII. figs. 7–14; p. 142).

1885. *Sepia kobiensis*, Hoyle, Diagnoses II., p. 195.

39. *Sepia capensis*, d'Orbigny.

1826. *Sepia capensis*, d'Orb., Céph. acét.; Seiches, pl. vii. figs. 1–3.
1832. „ *australis*, Q. et G., Voy. "Astrolabe," t. ii. p. 70, pl. v. figs. 3, 7.
1839. „ *capensis*, d'Orb., Céph. acét., p. 278; Seiches, pl. vii. figs. 1–3, pl. xii. figs. 7–11, pl. xvii. figs. 18, 19.
1849. „ *Sinope* (*?*), Gray, B.M.C., p. 106.

40. *Sepia elongata*, d'Orbigny.

1839. *Sepia elongata*, d'Orb., Céph. acét., p. 283; Seiches, pl. xxiv. figs. 7–10.

41. *Sepia elegans*, d'Orbigny.

1839. *Sepia elegans*, d'Orb., Céph. acét., p. 280; Seiches, pl. viii. figs. 1–5, pl. xxvii. figs. 3–6.

42. *Sepia ruppellaria*, d'Orbigny.

1839. *Sepia Rupellaria*, d'Orb., Céph. acét., p. 275; Seiches, pl. iii. figs. 10–13.
1851. „ *bisserialis*, Vér., Céph. médit., p. 73, pl. xxvi. figs. F, K.
1869. „ *rupellaria*, Fischer, Actes Linn. Soc. Bordeaux, t. xxvii. p. 125.

43. *Sepia lefebrei*, d'Orbigny.

1839. *Sepia Lefebrei*, d'Orb., Céph. acét., p. 282; Seiches, pl. xxiv. figs. 1–6.

44. *Sepia palmata*, Owen.

1881. *Sepia palmata*, Owen, Trans. Zool. Soc. Lond., vol. xi. part 5, p. 134, pls. xxiv., xxv.

45. *Sepia apama*, Gray.

1849. *Sepia apama*, Gray, B.M.C., p. 103.

46. *Sepia tuberculata*, Lamarck.

1799. *Sepia tuberculata*, Lmk., Mém. Soc. Hist. Nat. Paris, t. i. p. 9, pl. i. fig. 1.
1832. „ *papillata*, Q. et G., Voy. "Astrolabe," t. ii. p. 61, pl. i. figs. 6–14.
1875. „ *tuberculata*, Stp., Hemisepius, pp. 474, 479, pl. i. figs. 20, 21; pl. ii. fig. 6.

Subgenus *Metasepia*, Hoyle, 1885.

47. *Sepia* (*Metasepia*) *pfefferi*, Hoyle (Pl. XXI. figs. 1–10; p. 145).

1885. *Sepia* (*Metasepia*) *Pfefferi*, Hoyle, Diagnoses II., p. 199.

48. *Sepia* (*Metasepia*) *tullbergi*, Appellöf.

1886. *Sepia Tullbergi*, Appellöf, Japanska Ceph., p. 26, pl. ii. figs. 7–14.

(Species insufficiently characterised.)

49. *Sepia gibbosa*, Ehrenberg.

1831. *Sepia gibbosa*, Ehrbg., Symb. phys., Anim. Moll. Ceph., Sep., No. 2.
1869. „ „ Issel, Malacol. Mar Rosso, p. 238, pl. ii. figs. 14, 15.

50. *Sepia lycidas*, Gray.

1849. *Sepia Lycidas*, Gray, B.M.C., p. 103.

51. *Sepia brachycheira*, Tapparone-Canefri.

1877. *Sepia brachycheira*, Tapp.-Can., Ann. Mus. civ. Genova, vol. ix. p. 278.

52. *Sepia jousseaumi*, de Rochebrune.

1884. *Sepia Jousseaumi*, Rochebr., Monogr. Sepiadæ, p. 117.

53. *Sepia mozambica*, de Rochebrune.

1884. *Sepia Mozambica*, Rochebr., Monogr. Sepiadæ, p. 118.

54. *Sepia javanica* (de Rochebrune).

1884. *Acanthosepion Javanicum*, Rochebr., Monogr. Sepiadæ, p. 110.

55. *Sepia goreensis* (de Rochebrune).

1884. *Acanthosepion Goreense*, Rochebr., Monogr. Sepiadæ, p. 109.

56. *Sepia enoplon* (de Rochebrune).

1884. *Acanthosepion enoplon*, Rochebr., Monogr. Sepiadæ, p. 108.

57. *Sepia oculifera* (de Rochebrune).

1884. *Acanthosepion oculiferum*, Rochebr., Monogr. Sepiadæ, p. 107.

58. *Sepia antillarum*, d'Orbigny.

1838. *Sepia antillarum*, d'Orb., Moll. Cuba, t. i. p. 33.
1845. „ „ d'Orb., Moll. viv., p. 300.

Sepiella, Gray, 1849; Steenstrup, 1880.

Sepia, Auctt. (*pars*).

1. *Sepiella inermis* (van Hasselt, MS.), Steenstrup.

1839. *Sepia inermis*, d'Orb., Céph. acét., p. 286; Seiches, pl. vi. *bis* (= ♂), pl. xx. figs. 1–9 (= ♀).
1839. „ *sinensis*, d'Orb., Céph. acét., p. 289; Seiches, pl. ix. figs. 1, 2 (*fide* Gray).
1849. „ *microcheirus*, Gray, B.M.C., p. 107.
1875. „ *inermis*, Stp., Hemisepius, p. 478, pl. ii. fig. 3.
1880. *Sepiella inermis*, Stp., Sepiella, pp. 347–356, figs. 1–8.

2. *Sepiella ornata* (Rang), Steenstrup.

1837. *Sepia ornata*, Rang., Mag. de Zool., ann. vii., cl. v. p. 76, pl. ci.
1839. „ „ d'Orb., Céph. acét., p. 276; Seiches, pl. xxii.
1849. „ „ Gray, B.M.C., p. 106.
1880. *Sepiella ornata*, Stp., Sepiella, pp. 347–356.

3. *Sepiella curta*, Pfeffer.

1884. *Sepiella curta*, Pffr., Ceph. Hamb. Mus., p. 13, fig. 16.

4. *Sepiella ocellata*, Pfeffer.

1884. *Sepiella ocellata*, Pffr., Ceph. Hamb. Mus., p. 13, fig. 17.

5. *Sepiella ovata*, Pfeffer.

1884. *Sepiella ovata*, Pffr., Ceph. Hamb. Mus., p. 14, fig. 18.

6. *Sepiella obtusata*, Pfeffer.

1884. *Sepiella obtusata*, Pffr., Ceph. Hamb. Mus., p. 15, fig. 19.

7. *Sepiella tourrannensis* (Eydoux et Souleyet).

1852. *Sepia tourrannensis*, E. et S., Voy. "Bonite," p. 33, pl. iii. figs. 6–12.

8. *Sepiella affinis* (Eydoux et Souleyet).

1852. *Sepia affinis*, E. et S., Voy. "Bonite," p. 35, pl. iii. figs. 13, 14.

9. *Sepiella maindroni*, de Rochebrune (Pl. XXII. figs. 1–10 ; p. 149).

1884. *Sepiella Maindroni* Rochebr., Monogr. Sepiadæ, p. 89.

10. *Sepiella* (?) *dabryi* (de Rochebrune).

1884. *Diphtherosepion Dabryi*, Rochebr., Monogr. Sepiadæ, p. 81.

11. *Sepiella* (?) *martini* (de Rochebrune).

1884. *Diphtherosepion Martini*, Rochebr., Monogr. Sepiadæ, p. 81.

Hemisepius, Steenstrup, 1875.

1. *Hemisepius typicus*, Steenstrup.

1875. *Hemisepius typicus*, Stp., Hemisepius, pp. 465–479, pl. i. figs. 1–10 ; pl. ii. fig. 1.

Family IX. Loliginei, Steenstrup, 1861.

Sepioteuthis, Blainville, 1825.

Chondrosepia, Leuckart.

1. *Sepioteuthis sepioidea* (Blainville), d'Orbigny.

1823. *Loligo sepioidea*, Blv., Journ. de Phys., t. xcvi. p. 123.
1839. *Sepioteuthis sepioidea*, d'Orb., Céph. acét., p. 298; Sépioteuthes, pl. vii.
1875. „ „ Stp., Hemisepius, p. 478, pl. ii. figs. 7, 8.

2. *Sepioteuthis blainvilliana*, Férussac.

1839. *Sepioteuthis Blainvilliana*, d'Orb., Céph. acét., p. 303 ; Sépioteuthes, pl. ii.

3. *Sepioteuthis australis*, Quoy et Gaimard.

1832. *Sepioteuthis australis*, Q. et G., Voy. "Astrolabe," t. ii. p. 77, pl. iv. fig. 1.
1839. „ „ d'Orb., Céph. acét., p. 300 ; Sépioteuthes, pl. v. fig. 5, pl. vi. figs. 15–21.
1883. „ „ M'Coy, Nat. Hist. Victoria, Decade vii., pls. lxxvi., lxxvii.

4. *Sepioteuthis ehrhardti*, Pfeffer.

1884. *Sepioteuthis Ehrhardti*, Pffr., Ceph. Hamb. Mus., p. 3, fig. 1.

5. *Sepioteuthis mauritiana*, Quoy et Gaimard.

1832. *Sepioteuthis mauritiana*, Q. et G., Voy. "Astrolabe," t. ii. p. 76, pl. iv. figs. 2–6.
1839. „ „ d'Orb., Céph. acét., p. 305; Sépioteuthes, pl. v. figs. 1–4, pl. vii. figs. 1–5.

6. *Sepioteuthis lunulata*, Quoy et Gaimard.

1832. *Sepioteuthis lunulata*, Q. et G., Voy. "Astrolabe," t. ii. p. 74, pl. iii. figs. 8–13.
1832. „ *guinensis*, Q. et G., *Op. cit.*, p. 72, pl. iii. figs. 1–7.
1839. „ *lunulata*, d'Orb., Céph. acét., p. 300; Sépioteuthes, pl. iii. fig. 1, pl. vi. figs. 1–8.

7. *Sepioteuthis ovata*, Gabb.

1868. *Sepioteuthis ovata*, Gabb., Amer. Journ. Conch., vol. iv. p. 193, pl. xvii.

8. *Sepioteuthis sloanii*, Leach, MS.

1849. *Sepioteuthis Sloanii*, Gray, B.M.C., p. 81.

9. *Sepioteuthis bilineata* (Quoy et Gaimard), d'Orbigny.

1832. *Sepia bilineata*, Q. et G., Voy. "Astrolabe," t. ii. p. 66, pl. ii. fig. 1.
1839. *Sepioteuthis bilineata*, d'Orb., Céph. acét., p. 301; Sépioteuthes, pl. iv. fig. 2.

10. *Sepioteuthis neoguinaica*, Pfeffer.

1884. *Sepioteuthis neoguinaica*, Pffr., Ceph. Hamb. Mus., p. 4, fig. 2.

11. *Sepioteuthis lessoniana*, Férussac (p. 151).

1826. *Sepioteuthis Lessoniana*, d'Orb., Tabl. méth., Ann. d. Sci. Nat., t. vii. p. 155.
1830. „ „ Lesson, Voy. "Coquille," Moll., p. 241, pl. xi.
1839. „ „ d'Orb., Céph. acét., p. 302; Sépioteuthes, pls. i., vi. figs. 9–14.

12. *Sepioteuthis loliginiformis* (Leuckart), d'Orbigny.

1828. *Chondrosepia loliginiformis*, Lkt., Atlas Reise im nördl. Afrika, Wirbell. Th., p. 21, tab. vi. fig. 1.
1831. *Sepioteuthis Hemprichii* (?), Ehrbg., Symb. Phys., Anim. Moll. Ceph.
1839. „ *loliginiformis*, d'Orb., Céph. acét., p. 299; Sépioteuthes, pl. iv. fig. 1.

(Species insufficiently characterised.)

13. *Sepioteuthis major*, Gray.[1]

1828. *Sepioteuthis major*, Gray, Spicil. Zool., p. 3, pl. iv. fig. 1.
1849. „ „ Gray, B.M.C., p. 83.

14. *Sepioteuthis madagascariensis*, Gray.

1849. *Sepioteuthis madagascariensis*, Gray, B.M.C., p. 80.

[1] The figure is very suggestive of *Thysanoteuthis rhombus*, Troschel, with which Gray's remark "the giant of the genus" would also agree.

15. *Sepioteuthis brevis*, Owen.

1881. *Sepioteuthis brevis*, Owen, Trans. Zool. Soc. Lond., vol. xi. part 5, p. 137, pl. xxvi. fig. 1.

16. *Sepioteuthis sinensis*, d'Orbigny.

1839. *Sepioteuthis sinensis*, d'Orb., Céph. acét., p. 304.

17. *Sepioteuthis arctipinnis*, Gould.

1852. *Sepioteuthis arctipinnis*, Gld., Moll. Wilkes Exped., p. 479, fig. 593.

Loligo, Lamarck, 1799.

1. *Loligo vulgaris*, Lamarck.

1799. *Loligo vulgaris*, Lmk., Mém. Soc. Hist. Nat. Paris, t. i. p. 11.
1823. „ *pulchra*, Blv., Dict. d. Sci. Nat., t. xxvii. p. 144.
1833. „ *Rangii*, Fér., Céph. acét.; Calmars, pl. xix. figs. 4–6.
1839. „ *vulgaris*, d'Orb., Céph. acét., p. 308; Calmars, pls. viii.–x., xxii., xxiii. figs. 1–12.
1849. „ *neglecta*, Gray, B.M.C., p. 72.
1851. „ *Berthelotii* (?), Vér., Céph. médit., p. 93, pl. xxxvi. figs. h–k.
1869. „ *mediterranea*, Targ., Cef. Mus. Firenze, p. 36.
1869. „ *pulchra*, Fischer, Journ. de Conch., sér. 3, t. ix. p. 129.

2. *Loligo affinis*, Lafont.[1]

1871. *Loligo affinis*, Lafont, Actes Linn. Soc. Bordeaux, t. xxviii. p. 273, pl. xiii.
1872. „ „ Lafont, Journ. de Conch., sér. 3, t. xii. p. 22.

3. *Loligo macrophthalma*, Lafont.

1871. *Loligo macrophthalma*, Lafont, Actes Linn. Soc. Bordeaux, t. xxviii. p. 274, pl. xv.
1872. „ „ Lafont, Journ. de Conch., sér. 3, t. xii. p. 23.

4. *Loligo microcephala*, Lafont.

1871. *Loligo microcephala*, Lafont, Actes Linn. Soc. Bordeaux, t. xxviii. p. 273, pl. xiv.
1872. „ „ Lafont, Journ. de Conch., sér. 3, t. xii. p. 22.

5. *Loligo moulinsi*, Lafont.

1871. *Loligo Moulinsi*, Lafont, Actes Linn. Soc. Bordeaux, t. xxviii. p. 274.
1872. „ „ Lafont, Journ. de Conch., sér. 3, t. xii. p. 23.

6. *Loligo breviceps*, Steenstrup.

1861. *Loligo breviceps*, Stp., Vid. Meddel. nat. Foren. Kjøbenhavn, p. 289.
1871. „ *vulgaris*, Lenz, Jahresb. Comm. Kiel., Jahrg. i. p. 135.
1873. „ *brevipes*, Mörch, Nachrichtsbl. malak. Gesellsch., No. 5 (*err. typ.*) (*fide* Lenz).
1875. „ *breviceps*, Lenz, Jahresb. Comm. Kiel, Anhang., p. 23, pl. i. figs. 5, 6; pl. ii. figs. 1–9 (pub. 1878).

[1] I am inclined to suspect that some of Lafont's species are mere varieties, but as this opinion is based only on the brief published descriptions I refrain from giving it formal expression. It will be shown in the sequel (p. 157) that the greatest caution must be exercised in accepting distinctions based on the proportionate length of the body and fin.

7. *Loligo forbesii*, Steenstrup.

1856. *Loligo Forbesii*, Stp., Hectocotyl., p. 189, pl. i. fig. 2.
1858. „ *magna*, Adams, Gen. Rec. Moll., pl. iv. fig. 3.
1871. „ *Forbesii*, Lenz, Jahresb. Comm. Kiel, Jahrg. i. p. 135.
1885. „ „ Hoyle, Proc. Roy. Phys. Soc. Edin., vol. viii. p. 459.

8. *Loligo pealei*, Lesueur.

1821. *Loligo Pealii*, Les., Journ. Acad. Nat. Sci. Philad., p. 92.
1843. „ *punctata*, de Kay, Moll. New York, p. 3, pl. i. fig. 1.
1881. „ *Pealei*, Vll., Ceph. N. E. Amer., p. 308, pl. xxix. figs. 1–4; pl. xxxvii. figs. 1–3; pl. xxxix. fig. 4; pls. xl., xli.; pl. xlv. figs. 3, 4.

9. *Loligo edulis*, Hoyle (Pl. XXIII.; p. 152).

1885. *Loligo edulis*, Hoyle, Diagnoses II., p. 186.

10. *Loligo patagonica*, E. A. Smith.

1881. *Loligo patagonica*, E. A. Sm., Proc. Zool. Soc. Lond., p. 24, pl. iii. fig. 2.

11. *Loligo brasiliensis*, Blainville (p. 153).

1823. *Loligo brasiliensis*, Blv., Journ. de Phys., t. xcvi. p. 132.
1839. „ „ d'Orb., Céph. acét., p. 313; Calmars, pl. xii.; pl. xix. fig. 1; pl. xx. figs. 1–5.

12. *Loligo gahi*, d'Orbigny.

1835. *Loligo gahi*, d'Orb., Amér. mérid., p. 60, pl. iii. figs. 1, 2.
1839. „ „ d'Orb., Céph. acét., p. 316; Calmars, pl. xxi. figs. 3, 4.

13. *Loligo kobiensis*, Hoyle (Pl. XXV. figs. 1–10; p. 154).

1885. *Loligo kobiensis*, Hoyle, Diagnoses II., p. 184.

14. *Loligo pfefferi*, n. n.[1]

1884. *Loligo brevipinnis*, Pffr., Ceph. Hamb. Mus., p. 5, fig. 4.

15. *Loligo sumatrensis*, d'Orbigny.

1839. *Loligo sumatrensis*, d'Orb., Céph. acét., p. 317; Calmars, pl. xiii. figs. 1–3.

16. *Loligo spectrum*, Pfeffer.

1884. *Loligo spectrum*, Pffr., Ceph. Hamb. Mus., p. 5.

17. *Loligo duvaucelii*, d'Orbigny.

1839. *Loligo Duvaucelii*, d'Orb., Céph. acét., p. 318; Calmars, pls. xiv., xx. figs. 6–16.

18. *Loligo indica*, Pfeffer (Pl. XXVI.; p. 156).

1884. *Loligo indica*, Pffr., Ceph. Hamb. Mus., p. 4, fig. 3.

[1] The name proposed by Dr. Pfeffer too closely resembles *brevipinna*, already introduced into this genus by Lesueur. I have therefore taken the liberty of applying my friend's own name to the species.

19. *Loligo bleekeri*, Keferstein.

1866. *Loligo Bleekeri*, Bronn, Klass. u. Ord. d. Thierreichs, Bd. iii. p. 1402 ; pl. cxxii. figs. 9, 10; pl. cxxvii. fig. 14.
1882. „ „ Brock, Zeitschr. f. wiss. Zool., Bd. xxxvi. p. 604.
1886. „ „ Appellöf, Japanska Ceph., p. 31, pl. i. figs. 7–10.

20. *Loligo japonica*, Steenstrup, MS. (Pl. XXIV. figs. 7–15 ; p. 157).

1885. *Loligo japonica*, Hoyle, Diagnoses II., p. 187.

21. *Loligo galatheæ*, Steenstrup, MS. (Pl. XXVII.; p. 159).

1885. *Loligo galatheæ*, Hoyle, Diagnoses II., p. 183.

22. *Loligo subalata* (Gervais et van Beneden), Eydoux et Souleyet.

1838. *Sepiola subalata*, Gerv. et v. Ben., Bull. Acad. Sci. Bruxelles, t. v. p. 423.
1852. *Loligo subalata*, E. et S., Voy. "Bonite," p. 30, pl. iii. figs. 1–5.

23. *Loligo reynaudii*, d'Orbigny.

1839. *Loligo Reynaudii*, d'Orb., Céph. acét., p. 315 ; Calmars, pl. xxiv.

24. *Loligo plei*, Blainville.

1823. *Loligo Plei*, Blv., Journ. de Phys., t. xcvi. p. 132.
1839. „ „ d'Orb., Céph. acét., p. 312 ; Calmars, pls. xvi., xxiv. figs. 9–13.

25. *Loligo media* (Linné).

1767. *Sepia media*, Linn., Syst. nat., ed. x. p. 659 ; No. 262, 3.
1799. *Loligo subulata*, Lmk., Mém. Soc. Hist. Nat. Paris, t. i. p. 15.
1823. „ *spiralis*, Fér., Dict. Class. Hist. Nat., t. iii. p. 67, No. 6.
1848. „ *parva*, d'Orb., Céph. acét., p. 310 ; Calmars, pls. xvii., xxiii. figs. 19–21.
1849. *Teuthis parva*, Gray, B.M.C., p. 76.
1851. *Loligo marmoræ* (?), Vér., Céph. médit., p. 95, pl. xxxvii.

26. *Loligo* (?) *ellipsura*, Hoyle (Pl. XXIV. figs. 1–6 ; Pl. XXV. figs. 11–15 ; p. 160).

1885. *Loligo ellipsura*, Hoyle, Diagnoses II., p. 182.

(Species insufficiently characterised.)

27. *Loligo arabica* (Ehrenberg), Steenstrup.

1831. *Pteroteuthis arabica*, Ehrb., Symb. Phys., Anim. Moll. Ceph.
1845. *Ommastrephes arabicus*, d'Orb, Moll. viv., p. 428.
1880. *Loligo arabica*, Stp., Ommat. Blækspr., p. 95.

28. *Loligo australis*, Gray.

1849. *Loligo australis*, Gray, B.M.C., p. 71.

29. *Loligo chinensis*, Gray.

1849. *Loligo chinensis*, Gray, B.M.C., p. 74.

30. *Loligo emmakina*, Gray.

1849. *Loligo Emmakina*, Gray, B.M.C.. p. 71.

31. *Loligo hardwickei*, Gray.

1849. *Loligo Hardwickei*, Gray, B.M.C., p. 69.

32. *Loligo hemiptera*, Howell.

1867. *Loligo hemiptera*, Howell, Amer. Journ. Conch., vol. iii. p. 239, pl. xiii.

33. *Loligo lanceolata*, Rafinesque.

1814. *Loligo lanceolata*, Raf., Précis. découv. somiol., p. 29 (*nomen tantum*).

34. *Loligo odogadium*, Rafinesque.

1814. *Loligo odogadium*, Raf., Précis. découv. somiol., p. 29 (*nomen tantum*).

35. *Loligo tricarinata*, Gray.

1849. *Loligo tricarinata*, Gray, B.M.C., p. 73.

36. *Loligo gronovii*, Férussac.

1839. *Loligo Gronovii*, Fér. and d'Orb., Céph. acét., p. 319.
1880. „ „ Stp., Ommat. Blækspr., p. 97.

Loliolus, Steenstrup, 1856.

1. *Loliolus typus*, Steenstrup.

1856. *Loliolus typus*, Stp., Hectocotyl., p. 194, pl. i. fig. 5.

2. *Loliolus affinis*, Steenstrup.

1856. *Loliolus affinis*, Stp., Hectocotyl., p. 194, pl. i. fig. 6.

3. *Loliolus steenstrupi*, Dall.

1871. *Loliolus Steenstrupi*, Dall, Amer. Journ. Conch., vol. vii. p. 97.

Lolliguncula, Steenstrup, 1881.

1. *Lolliguncula brevis* (Blainville), Steenstrup.

1823. *Loligo brevis*, Blv., Journ. de Phys., t. xcvi. p. 133.
1824. „ *brevipinna* (*?*), Les., Journ. Acad. Nat. Sci. Philad., vol. iii. p. 282, pl. x.
1839. „ *brevis*, d'Orb., Céph. acét., p. 314; Calmars, pl. xiii. figs. 4–6; pl. xv. fig. 13; pl. xxiv. figs. 14–19.
1881. *Lolliguncula brevis*, Stp., Sepiadarium og Idiosepius, p. 242.

Division II. ŒGOPSIDA, d'Orbigny, 1839.

Family X. Ommastrephini, Steenstrup, 1861.

Subfamily Thysanoteuthidæ, Keferstein, 1866.

Thysanoteuthis, Troschel, 1857.

1. *Thysanoteuthis rhombus*, Troschel.

1857. *Thysanoteuthis rhombus*, Trosch., Archiv f. Naturgesch., Jahrg. xxiii. Bd. i. p. 70, pl. iv. fig. 12; pl. v. figs. 1–4.
1881. „ „ Vigelius, Mitth. Zool. Stat. Neapel, Bd. ii. p. 150.

2. *Thysanoteuthis elegans*, Troschel.

1851. *Sepioteuthis sicula* (?), Vér., Céph. médit., p. 75, pl. xxvii.
1857. *Thysanoteuthis elegans*, Trosch., Archiv f. Naturgesch., Jahrg. xxiii. Bd. i. p. 74, pl. iv. figs. 10, 11.

Subfamily Ommastrephidæ, Gill, 1871.

Ommastrephes, d'Orbigny, 1835.

Sthenoteuthis, Verrill.

1. *Ommastrephes bartramii* (Lesueur), d'Orbigny.

1821. *Loligo Bartramii*, Les., Journ. Acad. Nat. Sci. Philad., vol. ii. p. 90, pl. vii.
1835. *Ommastrephes Bartramii*, d'Orb., Amér. mérid., p. 55.
1835. „ *cylindricus*, d'Orb., Céph. acét., p. 54; Calmars, pl. iii. figs. 3, 4.
1839. „ „ d'Orb., *Op. cit.*, p. 347; Calmars, pl. ii.; Ommast., pl. ii. figs. 11–20.
1880. *Ommatostrephes Bartramii*, Stp., Ommat. Blækspr., pp. 79, 81, figs.[1]

2. *Ommastrephes gigas*, d'Orbigny.

1835. *Ommastrephes gigas*, d'Orb., Amér. mérid., p. 50, pl. iv.
1839. „ *giganteus*, d'Orb., Céph. acét., p. 350; Calmars, pl. xx.

3. *Ommastrephes pteropus*, Steenstrup.

1822. *Loligo todaropterus* (?), d. Ch., Mem. stor anim., pl. xcv. (*fide* Stp.).
1823. „ *Brongnartii* (?), Blv., Dict. sci. nat., t. xxvii. p. 142.
1856. *Ommatostrephes pteropus*, Stp., Vid. Meddel. nat. Foren. Kjøbenhavn, Aar 1855, p. 117.
1862. „ „ Stp., *Op. cit.*, Aar 1861, p. 285.
1880. *Sthenoteuthis pteropus*, Vll., Céph. N. E. Amer., p. 228, pl. xxvi.
1881. *Ommastrephes ensifer* (?), Owen, Trans. Zool. Soc. Lond., vol. xi. pt. 5, p. 144, pl. xxviii.
1885. *Ommatostrephes pteropus*, Stp., Notæ Teuthol., V.

[1] The greater number of the species of *Ommastrephes* are mentioned, and their systematic positions indicated in this paper, so I have not thought it necessary to repeat the reference in every case.

4. *Ommastrephes oualaniensis* (Lesson), d'Orbigny (p. 162).

1830. *Loligo oualaniensis*, Less., Voy. "Coquille," Zool., p. 240, pl. i. fig. 2.
1832. „ *vanikoriensis*, Q. et G., Voy. "Astrolabe," t. ii. p. 79, pl. v. figs. 1, 2.
1832. „ *brevitentaculata*, Q. et G., *Op. cit.*, p. 81.
1839. *Ommastrephes oualaniensis*, d'Orb., Céph. acét., p. 351; Calmars, pls. iii., xxi.; Ommast. pl. i. figs. 14, 15.
1862. „ *Tryonii* (*?*), Gabb, Proc. Acad. Nat. Sci. Philad., p. 483, with plate.
1863. „ *Ayresii* (*?*), Gabb, Carpenter, Rep. W. C. Moll., p. 613.
1880. *Ommatostrephes oualaniensis*, Stp., Ommat. Blækspr., pp. 76, 84, &c.

5. *Ommastrephes pelagicus* (Bosc), d'Orbigny.

1802. *Sepia pelagica*, Bosc, Hist. nat., Vers, t. i. p. 46, pl. i. figs. 1, 2.
1839. *Ommastrephes pelagicus*, d'Orb., Céph. acét., p. 348; Calmars, pl. xviii. figs. 1, 2; Ommast., pl. i. figs. 17, 18.
1849. „ „ Gray, B.M.C., p. 63 (subgen. *Hyaloteuthis*).

6. *Ommastrephes megapterus* (Verrill), Steenstrup.

1878. *Architeuthis megaptera*, Vll., Amer. Journ. Sci. and Arts, vol. xvi. p. 207.
1880. *Sthenoteuthis megaptera*, Vll., Ceph. N. E. Amer., pp. 223, 286, pl. xxi. figs. 1–9; pl. xxvi.
1880. *Ommatostrephes megapterus*, Stp., Sthenoteuthis og Lestoteuthis, pp. 3–8.

(Species insufficiently characterised.)

7. *Ommastrephes eblanæ* (Ball), Gray.

1841. *Loligo Eblanæ*, Ball, Proc. Roy. Irish Acad., vol. i. p. 363, figs. 1–7.
1850. *Ommastrephes Eblanæ*, Forbes and Hanley, Brit. Moll., vol. iv. p. 235, pl. sss. fig. 2.

8. *Ommastrephes insignis*, Gould.

1852. *Ommastrephes insignis*, Gld., Moll. Wilkes Exped., p. 480, fig. 594.

9. *Ommastrephes crassus*, Lafont.

1871. *Ommastrephes crassus*, Lafont, Actes Linn. Soc. Bordeaux, t. xxviii. p. 275, pl. xvi.

10. *Ommastrephes æquipoda*, Rüppell.

1844. *Loligo æquipoda*, Rüpp., Giorn. Gab. Messina, t. xxvi. (*fide* Vér.).
1851. „ „ Vér., Céph. médit., p. 105, pl. xxxv. figs. *a*, *b*.

Dosidicus, Steenstrup, 1857.

1. *Dosidicus eschrichtii*, Steenstrup.

1857. *Dosidicus Eschrichtii*, Stp., Oversigt K. D. Vid. Selsk. Forhandl., p. 11.
1880. „ „ Stp., Ommat. Blækspr., pp. 79, 81, 89, with woodcuts.

2. *Dosidicus steenstrupii*, Pfeffer.

1884. *Dosidicus Steenstrupii*, Pffr., Ceph. Hamb. Mus., p. 20, fig. 27.

Todarodes, Steenstrup, 1880.

Ommastrephes, d'Orbigny (*pars*).

1. *Todarodes sagittatus* (Lamarck), Steenstrup.

1758. *Loliginis species maxima*, Seba, Rer. Nat. Thes., tom. iii. tab. iv. figg. 1, 2.
1799. *Loligo sagittata*, Lmk., Mém. Soc. Hist. Nat. Paris, t. i. p. 13.
1829. „ *todarus*, d. Ch., Mem. stor. anim., t. iv. p. 161, tav. lx.
1830. *Ommastrephes todarus*, d'Orb., Céph. acét., p. 349; Calmars, pl. i.; Ommast., pl. ii. figs. 4–10.
1880. *Todarodes sagittatus*, Stp., Ommat. Blækspr., pp. 83, 90, &c.

2. *Todarodes pacificus*, Steenstrup (Pl. XXVIII. figs. 1–5; p. 163).

1880. *Todarodes pacificus*, Stp., Ommat. Blækspr., pp. 83, 90, &c.
1886. *Ommastrephes pacificus*, Appellöf, Japanska Ceph., p. 35, pl. iii. figs. 8–10.

3. *Todarodes* (*?*) *sloanii* (Gray), Steenstrup.

1849. *Ommastrephes Sloanii*, Gray, B.M.C., p. 61.
1880. ———— (*?*) *Sloanei*, Stp., Ommat. Blækspr., p. 98.

Illex, Steenstrup, 1880.

Ommastrephes, d'Orbigny (*pars*).

1. *Illex illecebrosus* (Lesueur), Steenstrup.

1821. *Loligo illecebrosa*, Les., Journ. Acad. Nat. Sci. Philad., vol. ii. p. 95.
1825. „ *piscatorum*, La Pylaie, Ann. d. Sci. Nat., sér. 1, t. iv. p. 319.
1839. *Ommastrephes sagittatus*, d'Orb., Céph. acét., p. 345; Calmars, pls. iv., vi. (*pars*).
1880. *Illex illecebrosus*, Stp., Ommat. Blækspr., pp. 82, 90, &c.
1881. *Ommastrephes illecebrosa*, Vll., Ceph. N. E. Amer., p. 268, pl. xxviii.; pl. xxix. fig. 5; pl. xxxvii. fig. 8; pl. xxxix.

2. *Illex coindetii* (Vérany), Steenstrup.

1837. *Loligo Coindetii*, Vér., Mem. Accad. Sci. Torino, t. i. p. 94, pl. iv.
1839. *Ommastrephes sagittatus*, d'Orb., Céph. acét., p. 345; Ommast., pl. i. figs. 1–10 (*pars*).
1851. *Loligo Pillæ* (*?*), Vér., Céph. médit., p. 112; pl. xxxvi. figs. d–g.
1880. *Illex Coindetii*, Stp., Ommat. Blækspr., pp. 82, 90, &c.

Architeuthus, Steenstrup, 1856.[1]

Architeuthis, Auctt.

1. *Architeuthus monachus*, Steenstrup.

1857. *Architeuthis monachus*, Stp., Coloss. Blækspr., p. 182 (*nomen tantum*).
1861. „ *dux*, Harting, Verhandel. k. Akad. Weten., Dl. ix. p. 11, pl. i.
1880. „ *monachus*, Vll., Ceph. N. E. Amer., pp. 238–245.
1880. „ *Hartingii* (*?*), Vll., *Op. cit.*, p. 240.

2. *Architeuthus dux*, Steenstrup.

1857. *Architeuthis dux*, Stp., Coloss. Blækspr., p. 128 (*nomen tantum*).
1862. *Loligo Bouyeri*, Crosse et Fischer, Journ. de Conch., sér. 3, t. ii. p. 138.
1875. *Architeuthis dux*, Gervais, Journ. de Zool., t. iv. p. 90.
1880. „ „ Vll., Ceph. N. E. Amer., p. 238.

3. *Architeuthus harveyi* (Kent), Verrill.

1874. *Megaloteuthis Harveyi*, Kent, Proc. Zool. Soc. Lond., pp. 178, 489.
1880. *Architeuthis Harveyi*, Vll., Ceph. N. E. Amer., p. 197, pls. xiii.–xvia.
1882. „ „ Vll., *Op. cit.*, p. 422.

4. *Architeuthus princeps*, Verrill.

1875. *Architeuthis princeps*, Vll., Amer. Journ. Sci. and Arts, vol. ix. pp. 124, 181, pl. v.
1880. „ „ Vll., Ceph. N. E. Amer., p. 210, pls. xvii.–xx.

5. *Architeuthus martensi* (Hilgendorf), Steenstrup.

1880. *Megateuthus Martensii*, Hilgd., Sitzungsb. naturf. Freunde Berlin, p. 65.
1882. *Architeuthus martensii*, Stp., Notæ Teuthol. III., p. 157.

6. *Architeuthus grandis* (Owen), Verrill.

1881. *Plectoteuthis grandis*, Owen, Trans. Zool. Soc. Lond., vol. xi. pt. 5, p. 156, pls. xxxiv., xxxv.
1881. *Architeuthis grandis*, Vll., Ceph. N. E. Amer., p. 400.
1882. *Architeuthus* sp., Stp., Notæ Teuthol. IV., p. 164.

Mouchezia,[2] Vélain, 1877.

1. *Mouchezia sancti-pauli*, Vélain.

1877. *Mouchezis Sancti-Pauli*, Vélain, Archives d. Zool. expér., t. vi. p. 83, fig. 8. (*err. typ. ?*)

[1] For generic characters see Steenstrup, Ommat. Blækspr., p. 102 ; and Vll., Ceph. N. E. Amer., p. 197.
[2] The validity of this genus is very doubtful.

Tracheloteuthis, Steenstrup, 1881.

Verrilliola, Pffr.
Entomopsis, Rochebr. (?).

1. *Tracheloteuthis riisei*, Steenstrup (Pl. XXVIII. figs. 6–12; p. 164).

1881. *Tracheloteuthis Riisei*, Stp., Vid. Meddel. nat. Foren. Kjøbenhavn, p. 294.
1884. *Verrilliola gracilis* (?), Pffr., Ceph. Hamb. Mus., p. 22, fig. 28.

2. *Tracheloteuthis behnii*, Steenstrup.

1881. *Tracheloteuthis Behnii*, Stp., Vid. Meddel. nat. Foren. Kjøbenhavn, p. 294.
1884. *Verrilliola nympha* (?) Pffr., Ceph. Hamb. Mus., p. 23, fig. 29.

3. *Tracheloteuthis* (?) *velaini* (de Rochebrune).

1884. *Entomopsis Velaini*, Rochebr., Monogr. Loligopsidæ, p. 21, pl. ii. figs. 7–11.

4. *Tracheloteuthis* (?) *clouei* (de Rochebrune).

1884. *Entomopsis Clouei*, Rochebr., Monogr. Loligopsidæ, p. 22.

Bathyteuthis, Hoyle, 1885.

Benthoteuthis, Verrill.

1. *Bathyteuthis abyssicola*, Hoyle (Pl. XXIX. figs. 1–7; p. 168).

1885. *Bathyteuthis abyssicola*, Hoyle, Narr. Chall. Exp., p. 272, fig. 108.
1885. „ „ Hoyle, Prelim. Rep. II., p. 308, fig. 2.

2. *Bathyteuthis megalops* (Verrill).

1885. *Benthoteuthis megalops*, Verrill, Third Catal., p. 402, pl. xliv. fig. 1.

Steenstrupiola, Pfeffer, 1884.

1. *Steenstrupiola chilensis*, Pfeffer.

1884. *Steenstrupiola chilensis*, Pffr., Ceph. Hamb. Mus., p. 16, fig. 20.

2. *Steenstrupiola atlantica*, Pfeffer.

1884. *Steenstrupiola atlantica*, Pffr., Ceph. Hamb. Mus., p. 17, fig. 21.

Subfamily Mastigoteuthidæ, Verrill, 1881.

Mastigoteuthis, Verrill, 1881.

1. *Mastigoteuthis agassizii*, Verrill (Pl. XXIX. figs. 8–10; p. 170).

1881. *Mastigoteuthis Agassizii*, Vll., "Blake" Rep., p. 100, pls. i., ii. figs. 2, 3.
1881. „ „ Vll., Ceph. N. E. Amer., p. 297, pls. xlviii., xlix. figs. 2, 3.

Family XI. Onychii, Steenstrup, 1861.

Subfamily Onychoteuthidæ, Gray, 1849 (*sensu stricto*).

Enoploteuthis, d'Orbigny, 1839.

1. *Enoploteuthis leptura* (Leach), d'Orbigny.

1817. *Loligo lepturo*, Leach, Zool. Miscell., vol. iii. p. 141 (*err. typ.*).
1817. „ *Smythii*, Leach, *Ibid.*
1839. *Enoploteuthis leptura*, d'Orb., Céph. acét., p. 337; Onychot., pl. vi., pl. xi. figs. 6–14, pl. xii. figs. 10–24.
1849. „ *Smithii*, Gray, B.M.C., p. 47.

2. *Enoploteuthis margaritifera*, Rüppell (Pl. XXIX. fig. 11; p. 171).

1844. *Enoploteuthis margaritifera*, Rüpp., Giorn. Gab. Messina, t. xxvi. p. 2, fig. 1 (*fide* Vér.).
1851. „ „ Vér., Céph. médit., p. 82, pl. xxx. fig. a.
1858. „ „ Claus, Archiv f. Naturgesch., Jahrg. xxiv. Bd. i. p. 262, Taf. x. fig. 2.

3. *Enoploteuthis pallida*, Pfeffer.

1884. *Enoploteuthis pallida*, Pffr., Ceph. Hamb. Mus., p. 18, fig. 23.

4. *Enoploteuthis hoylei*, Pfeffer.

1884. *Enoploteuthis Hoylei*, Pffr., Ceph. Hamb. Mus., p. 17, fig. 22.

Cucioteuthus, Steenstrup, 1882.

Enoploteuthis, Auctt. (*pars*).

1. *Cucioteuthus unguiculatus* (Molina), Steenstrup.

1782. *Sepia unguiculata*, Molina, Saggio Stor. Nat. Chili, p. 199 (*fide* d'Orb.).
1818. *Onychoteuthis Molinæ*, Licht., Sepien mit Krallen, p. 13.
1861. ————————, Harting, Verhandel. k. Akad. Weten., Dl. ix. pl. iii. figs. 16, 17.
1881. *Enoploteuthis Cookii*, Owen, Trans. Zool. Soc. Lond., vol. xi. pt. 5, p. 150, pls. xxx.–xxxii.; pl. xxxiii. fig. 1 (*pars*).
1882. *Cucioteuthus unguiculatus*, Stp., Notæ Teuthol. III., p. 153.

Ancistrocheirus, Gray, 1849.

Enoploteuthis, Auctt. (*pars*).

1. *Ancistrocheirus lesueurii* (d'Orbigny et Férussac), Gray.

1839. *Enoploteuthis Lesueurii*, d'Orb. et Fér., Céph. acét., p. 339; Onychot., pl. xi. figs. 1–5; pl. xiv. figs. 4–10.
1849. *Ancistrocheirus Lesueurii*, Gray, B.M.C., p. 49.

2. *Ancistrocheirus megaptera*, Verrill.

1885. *Ancistrocheirus megaptera*, Vll., Third Catal., p. 399, pl. xlii. fig. 1.

Abralia, Gray, 1849.

Enoploteuthis, Auctt. (*pars*).

1. *Abralia armata* (Quoy et Gaimard), Gray.

1832. *Onychoteuthis armatus*, Q. et G., Voy. "Astrolabe," t. ii. p. 84, pl. v. figs. 14–22.
1839. *Enoploteuthis armata*, d'Orb., Céph. acét., p. 340; Onychot., pl. ix. figs. 2–6, pl. xiv. figs. 11–15.
1849. *Abralia armata*, Gray, B.M.C., p. 50.

2. *Abralia morisii* (Vérany), Gray.

1837. *Onychoteuthis Morisii*, Vér., Mem. Accad. Sci. Torino, ser. 2, t. i. p. 100, pl. ii.
1849. *Abralia Morisii*, Gray, B.M.C., p. 50.

3. *Abralia veranyi* (Rüppell).

1844. *Enoploteuthis Veranyi*, Rüpp., Giorn. Gab. Messina, t. xxvi. p. 3, fig. 2 (*fide* Vér.).
1851. „ „ Vér., Céph. médit., p. 83, pl. xxx. fig. b.

4. *Abralia oweni* (Vérany).

1851. *Enoploteuthis Owenii*, Vér., Ceph. médit., p. 84, pl. xxx. figs. c, d.
1858. „ „ Claus, Archiv f. Naturgesch., Jahrg. xxiv. Bd. i. p. 261, pl. x. fig. 1.

5. *Abralia polyonyx* (Troschel).

1857. *Enoploteuthis polyonyx*, Trosch., Archiv f. Naturgesch., Jahrg. xxiii. Bd. i. p. 87, pl. iv. fig. 9.

6. *Abralia megalops*, Verrill.

1882. *Abralia megalops*, Vll., Amer. Journ. Sci. and Arts, vol. xxiv. p. 364.
1883. „ „ Vll., "Blake" Suppl., p. 105, pl. iii. fig. 4.
1884. „ „ Vll., Second Catal., p. 143, pl. xxviii. fig. 2.

Verania, Krohn, 1847.

Octopodoteuthis, Krohn et Rüppell, Gray.

1. *Verania sicula*, Krohn.

1844. *Octopoteuthis sicula*, Rüpp., Giorn. Gab. Messina, t. xxxvi. p. 6 (*fide* Vér.).
1845. *Octopodoteuthis sicula*, Krohn, Archiv f. Naturgesch., Jahrg. xi. Bd. i. p. 47, pl. v.
1851. *Verania sicula*, Vér., Céph. médit., p. 78, pl. xxviii.
1884. *Octopodoteuthis sicula*, Pfr., Ceph. Hamb. Mus., p. 28.

Onychoteuthis, Lichtenstein, 1818.

1. *Onychoteuthis banskii* (Leach), Férussac.[1]

1817. *Loligo Banskii*, Leach, Zool. Miscell., vol. iii. p. 141.
1839. *Onychoteuthis Banskii*, d'Orb. et Fér., Céph. acét., p. 332; Onychot., pl. i., pl. ii. figs. 1, 2, pls. iii.–v. figs. 1–3, pl. ix. fig. 1, pl. xii. figs. 1–9.
1821. *Onykia angulata*, Les., Journ. Acad. Nat. Sci. Philad., vol. ii. p. 99, pl. ix. fig. 3.

2. *Onychoteuthis fusiformis*, Gabb.

1862. *Onychoteuthis fusiformis*, Gabb, Proc. Calif. Acad. Nat. Sci., vol. ii. p. 171.

3. *Onychoteuthis æquimanus*, Gabb.

1868. *Onychoteuthis æquimanus*, Gabb, Amer. Journ. Conch., vol. iv. p. 23, pl. ii.

4. *Onychoteuthis lobipennis*, Dall.

1872. *Onychoteuthis lobipennis*, Dall, Amer. Journ. Conch., vol. vii. p. 96.

5. *Onychoteuthis raptor*, Owen.

1881. *Onychoteuthis raptor*, Owen, Trans. Zool. Soc. Lond., vol. xi. pt. 5, p. 148, pl. xxix.

6. *Onychoteuthis ingens*, E. A. Smith.

1881. *Onychoteuthis ingens*, E. A. Sm., Proc. Zool. Soc. Lond., p. 25, pl. iii. fig. 1.

7. *Onychoteuthis brachyptera*, Pfeffer.

1884. *Onychoteuthis brachyptera*, Pffr., Ceph. Hamb. Mus., p. 20, fig. 26.

(Species insufficiently characterised.)

8. *Onychoteuthis rutilus*, Gould.

1852. *Onychoteuthis rutilus*, Gld., Moll. Wilkes Exped., p. 482, fig. 595.

9. *Onychoteuthis brevimanus*, Gould.

1852. *Onychoteuthis brevimanus*, Gld., Moll. Wilkes Exped., p. 483, fig. 596.

10. *Onychoteuthis* (*?*) *longimanus*, Steenstrup.

1857. *Onychoteuthis* (*?*) *longimanus*, Stp., Vid. Meddel. nat. Foren. Kjøbenhavn, Aar 1856, p. 120.
1875. „ (*??*) *lorigera*, Stp., Hemisepius, p. 473.

[1] This species has also at various times received the specific names *Lessonii*, *Bergii*, *Bartlingii*, *Bellonii*, *Fleurii*, a full account of which is given by d'Orbigny (*loc. cit.*).

Ancistroteuthis, Gray, 1849.

Onychoteuthis, Auctt. (*pars*).
Moroteuthis, Verrill.
Lestoteuthis, Verrill (*pars*).

1. *Ancistroteuthis lichtensteinii* (Férussac), Gray.

1839. *Onychoteuthis Lichtensteinii*, Fér., Céph. acét., p. 334; Onychot., pls. viii., xiv. figs. 1–3.
1849. *Ancistroteuthis Lichtensteinii*, Gray, B.M.C., p. 55.
1851. *Onychoteuthis Lichtensteinii*, Vér., Céph. médit., p. 78, pl. xxix. figs. a–c.

2. *Ancistroteuthis dussumieri* (d'Orbigny), Gray.

1839. *Onychoteuthis Dussumieri*, d'Orb., Céph. acét., p. 335; Onychot., pl. xiii.
1849. *Ancistroteuthis Dussumieri*, Gray, B.M.C., p. 56.

3. *Ancistroteuthis robusta* (Dall), Steenstrup.

1873. *? Onychoteuthis Bergi*, Dall, American Naturalist, vol. vii. p. 484.
1876. *Ommastrephes robustus*, Dall MS., Vll., Amer. Journ. Sci. and Arts, vol. xii. p. 236.
1880. *Onychoteuthis robusta*, Vll., Ceph. N. E. Amer., p. 246, pls. xxiii., xxiv.
1880. *Ancistroteuthis robusta*, Stp., Sthenoteuthis og Lestoteuthis, p. 19.
1881. *Moroteuthis robusta*, Vll., Ceph., N. E. Amer., p. 393.
1882. *Ancistroteuthis robusta*, Stp., Notæ Teuthol. II., p. 150.

Teleoteuthis,[1] Verrill, 1882.

Onychia, Lesueur.
Onychoteuthis, Auctt. (*pars*).

1. *Teleoteuthis caribbæa* (Lesueur), Verrill (Pl. XXX. figs. 1–8; p. 172).

1821. *Onykia carribæa*, Les., Journ. Acad. Nat. Sci. Philad., vol. ii. p. 98, pl. ix. figs. 1, 2 *a–e*.
1839. *Onychoteuthis cardioptera*, d'Orb., Céph. acét., p. 333; Cranchies, pl. i.; Onychot., pl. v. figs. 4–6 (*pars ?*).
1849. *Onychia cardioptera*, Gray, B.M.C., p. 57.
1882. *Teleoteuthis carribæa*, Vll., Ceph. N. E. Amer. (Fish Comm. Rep.), p. 70.
1884. *Onychia binotata* (*?*), Pfr., Ceph. Hamb. Mus., p. 19, fig. 24.

2. *Teleoteuthis platyptera* (d'Orbigny), Verrill.

1835. *Onychoteuthis platyptera*, d'Orb., Amér. mérid., p. 41, pl. iii. figs. 8–11.
1839. „ *platyptera*, d'Orb., Céph. acét., p. 335; Onychot., pl. x. figs. 8–10, pl. xiv. figs. 14–22.

3. *Teleoteuthis peratoptera* (d'Orbigny).

1835. *Onychoteuthis peratoptera*, d'Orb., Amér. mérid., p. 39, pl. iii. figs. 5–7.

[1] It is not without a feeling of regret that one abandons a generic name so time-honoured as that of Lesueur, but since the name is preoccupied, and since Verrill has proposed a new one, there seems no longer any excuse for retaining it.

4. *Teleoteuthis curta* (Pfeffer).

1884. *Onychia curta*, Pfr., Ceph. Hamb. Mus., p. 19, fig. 25.

5. *Teleoteuthis krohnii* (Vérany), Verrill.

1851. *Onychoteuthis Krohnii*, Vér., Céph. médit., p. 80, pl. xxix. figs. *d*, *e*.
1851. *Loligo Bianconii* (?), Vér., *Ibid.*, p. 100, pl. xxxv. figs. *i–l*.
1880. *Onychia Krohnii*, Stp., Sthenoteuthis og Lestoteuthis, p. 19 (note).
1882. *Teleoteuthis Krohnii*, Vll., Ceph. N. E. Amer. (Fish. Comm. Rep.), p. 70.

6. *Teleoteuthis agilis*, Verrill.

1885. *Teleoteuthis agilis*, Vll., Third Catal., p. 400, pl. xlii. fig. 2.

7. *Teleoteuthis* (?) *meneghini* (Vérany).

1851. *Loligo Meneghini*, Vér., Céph. médit., p. 98, pl. xxxiv. figs. *c*, *e*.
1880. *Onychia* (?) *Meneghini*, Stp., Ommat. Blækspr., p. 99.

Subfamily Gonatidæ, nov.

Gonatus, Gray, 1849.

Sepia Loligo, Fabricius.
Onychoteuthis, Lichtenstein, Møller, Middendorff.
Owenia, Prosch (*pars*).
Lestoteuthis, Verrill (*pars*).
Cheloteuthis, Verrill.

1. *Gonatus fabricii* (Lichtenstein), Steenstrup (p. 174).

1780. *Sepia loligo*, Fabr., Faun. grœnl., p. 358.
1818. *Onychoteuthis Fabricii*, Licht., Sepien mit Krallen, p. 13.
1842. „ „ Møller, Ind. Moll. grœnl., p. 3.
1842. „ (?) *amoena*, Møller, *Ibid.*, p. 3.
1849. „ *Kamtschatica*, Middff., Mém. Acad. Sci. St. Petersb., sér. 6, t. vi. p. 515, pl. xii. figs. 1–6.
1849. *Gonatus amœna*, Gray, B.M.C., p. 68.
1858. *Gonatus amœna*, Adams, Gen. Rec. Moll., p. 36, pl. iv. fig. 2.
1878. „ *amoenus*, Sars, Moll. Reg. Arct. Norv., p. 336, pl. xxxi.
1880. *Lestoteuthis Kamtschatica*, Vll., Ceph. N. E. Amer., p. 251.
1880. *Gonatus Fabricii*, Stp., Sthenoteuthis og Lestoteuthis, p. 9, pl. i.
1881. „ „ Vll., Ceph. N. E. Amer., p. 291, pl. xlv. figs. 1, 2.
1881. *Cheloteuthis rapax*, Vll., *Op. cit.*, p. 293, pl. xlix. fig. 1.
1881. *Lestoteuthis Fabricii*, Vll., *Op. cit.*, pp. 387–393, pl. xlv. figs. 1, 2; pl. xlix. fig. 1; pl. lv. fig. 1.
1882. *Gonatus Fabricii*, Stp., Notæ Teuthol. I., p. 143.

Of uncertain relationship.

——— *carunculata* (Schneider).

1788. *Sepia carunculata*, Schneider, Beobacht. u. Entdeck., Bd. v. p. 42 (*fide* d'Orb.).
1845. *Loligo carunculata*, d'Orb., Moll. viv., p. 352.

Family XII. Taonoteuthi, Steenstrup, 1861.

Subfamily Chiroteuthidæ, Gray, 1849.

Chiroteuthis, d'Orbigny, 1839.

Loligopsis, Férussac (*pars*).

1. *Chiroteuthis veranyi* (Férussac), d'Orbigny.

1835. *Loligopsis Veranyi*, Fér., Mag. de Zool., ann. v., cl. v., pl. lxv.
1839. *Chiroteuthis Veranyi*, d'Orb., Céph. acét., p. 325; Calmarets, pls. ii., iv. figs. 17–23.
1851. *Loligopsis Veranyi*, Vérany, Céph. médit., p. 120, pls. xxxviii., xxxix.

2. *Chiroteuthis bonplandi* (Vérany), d'Orbigny.

1837. *Loligopsis Bomplandi*, Vér., Mem. Accad. Sci. Torino, ser. 2, t. i. p. 99, pl. i.
1839. *Chiroteuthis Bonplandi*, d'Orb., Céph. acét., p. 326.

3. *Chiroteuthis lacertosa*, Verrill.

1881. *Chiroteuthis bonplandi* (?), Vll., "Blake" Rep., p. 102, pl. iii. fig. 1.
1881. „ *lacertosa*, Vll., Ceph. N. E. Amer., pp. 299, 408, pl. xlvii. fig. 1; pl. lvi. fig. 1.

Histiopsis, Hoyle, 1885.

1. *Histiopsis atlantica*, Hoyle (Pl. XXX. figs. 9–15; p. 180).

1885. *Histiopsis atlantica*, Hoyle, Narr. Chall. Exp., vol. i. p. 273 (*nomen tantum*).
1885. „ „ Hoyle, Diagnoses II., p. 201.

Calliteuthis, Verrill, 1880.

Loligopsis, Owen (*pars*).

1. *Calliteuthis reversa*, Verrill (Pl. XXXIII. figs. 12–15; p. 183).

1880. *Calliteuthis reversa*, Vll., Amer. Journ. Sci. and Arts, vol. xx. p. 393.
1881. „ „ Vll., Ceph. N. E. Amer., p. 295, pl. xlvi. fig. 1.
1884. „ „ Vll., Second Catal., p. 243.

2. *Calliteuthis ocellata* (Owen), Verrill.

1881. *Loligopsis ocellata*, Owen, Trans. Zool. Soc. Lond., vol. xi. pt. 5, pp. 139–143, pl. xxvi. figs. 3–8; pl. xxvii.
1881. *Calliteuthis ocellata*, Vll., Ceph. N. E. Amer., p. 402.

Brachioteuthis,[1] Verrill, 1881.

1. *Brachioteuthis beanii*, Verrill.

1881. *Brachioteuthis Beanii*, Vll., Ceph. N. E. Amer., p. 406, pl. lv. fig. 3; pl. lvi. fig. 2.

Doratopsis, de Rochebrune, 1884.

Hyaloteuthis, Pfeffer.
Leptoteuthis, Verrill.

1. *Doratopsis vermicularis* (Rüppell), de Rochebrune.[2]

1844. *Loligopsis vermicularis*, Rüpp., Giorn. Gab. Messina, t. xxvi. (*fide* Vér.).
1851. „ „ Vér., Céph. médit., p. 123, pl. xl. figs. *a*, *b*.
1884. *Doratopsis vermicularis*, Rochebr., Monogr. Loligopsidæ, p. 18.
1884. „ *Rüppelli*, Rochebr., *Ibid.*, p. 19.
1884. *Hyaloteuthis vermicularis*, Pfr., Ceph. Hamb. Mus., p. 28, fig. 30.
1884. *Leptoteuthis vermicolaris*, Vll., Second Catal., p. 143.
1885. *Doratopsis vermicularis*, Hoyle, Loligopsis, p. 329.

2. *Doratopsis diaphana* (Verrill).

1884. *Leptoteuthis diaphana*, Vll., Second Catal., p. 141, pl. xxxii. fig. 1.

Histioteuthis, d'Orbigny, 1839.

Cranchia, Férussac (*pars*).

1. *Histioteuthis bonelliana* (Férussac), d'Orbigny.

1835. *Cranchia Bonelliana*, Fér., Mag. de Zool., ann. v., cl. v., pl. lxvi.
1839. *Histioteuthis Bonelliana*, d'Orb., Céph. acét., p. 327; Cranchies, pl. ii.

[1] "This genus probably includes the *Chiroteuthis bonplandi*, Vérany, from the eastern Atlantic" (Verrill, *op. cit.*, p. 405).

[2] It is not a little remarkable that this curious species should have remained undisturbed for forty years in the genus *Loligopsis*, and that then within a year no less than three genera should have been formed for its reception. It is rather unfortunate that the name proposed by de Rochebrune, who has only copied Vérany's very unsatisfactory diagnosis, should have preference over those suggested by Pfeffer and Verrill, who have added considerably to our knowledge of this genus; they have both, however, chosen names which were preoccupied (see Gray, B.M.C., p. 63, and d'Orb., Moll. viv., p. 363). With respect to the identity of the two forms figured by Vérany, Prof. Steenstrup informs me that he has had the opportunity of examining them both; a specimen of one (Vérany, *loc. cit.*, fig. *b*) was given by Krohn to Vérany, by Vérany to Kölliker, and by Kölliker to Steenstrup, and is now in the Copenhagen Museum; of the other (fig. *a*), Prof. Steenstrup examined the original specimen preserved in the Museum Senkenbergianum, Frankfort, and found that the shortness of the mantle was due to its having been folded, a fact which had not been observed owing to the transparency of the animal, and that the difference in the fin is owing to mutilation. The gladius, so far as he was able to examine it, presents some resemblance to the curious pen described on p. 178 of the present Report.

Dr. Pfeffer's generic name being invalid, it would be necessary to change the family name, which he has proposed (Hyaloteuthidæ), to correspond with the one which has the preference, but I think that for the present this form may be placed among the Chiroteuthidæ.

2. *Histioteuthis ruppelli*, Vérany.

1851. *Histioteuthis Ruppelli*, Vér., Céph. médit., p. 117, pls. xx., xxi.

3. *Histioteuthis collinsii*, Verrill.

1879. *Histioteuthis Collinsii*, Vll., Amer. Journ. Sci. and Arts, vol. xvii. p. 241.
1882. „ „ Vll., Ceph. N. E. Amer., pp. 234, 300, 404, pl. xxiii.; pl. xxvii. figs. 3–5; pl. xxxvii. fig. 5; pl. lv. fig. 6.

Family XIII. Cranchiæformes, Steenstrup, 1861.

Subfamily Cranchiadæ, Gray, 1849.

Cranchia, Leach, 1817.

1. *Cranchia scabra*, Leach.

1817. *Cranchia scabra*, Leach, Zool. Miscell., vol. iii. p. 140.
1836. „ „ Owen, Trans. Zool. Soc. Lond., vol. ii. p. 105 (with figs.).
1838. *Philonexis Eylais*, d'Orb., Céph. acét., p. 102; Poulpes, pl. xvii. figs. 4, 5.
1861. *Cranchia scabra*, Stp., Overblik, p. 72.

2. *Cranchia hispida*, Pfeffer.

1884. *Cranchia hispida*, Pffr., Ceph. Hamb. Mus., p. 27, fig. 37.

3. *Cranchia tenuitentaculata*, Pfeffer.

1884. *Cranchia tenuitententaculata*, Pffr., Ceph. Hamb. Mus., p. 26, fig. 36 (*err. typ.*).

4. *Cranchia megalops*, Prosch.

1847. *Cranchia megalops*, Prosch, K. dansk. Vidensk. Selsk. Skriv., Rk. 5, Bd. i. p. 64 (with figs.).
1861. „ „ Stp., Overblik, p. 77.

5. *Cranchia* (*?*) *maculata*, Leach.

1817. *Cranchia maculata*, Leach, Zool. Miscell., vol. iii. p. 140.

Subgenus, *Liocranchia*, Pfeffer, 1884.

6. *Cranchia brockii* (Pfeffer).

1884. *Liocranchia Brockii*, Pffr., Ceph. Hamb. Mus., p. 25, fig. 33.

7. *Cranchia reinhardtii*, Steenstrup (Pl. XXXI. figs. 11–14; Pl. XXXII. figs. 1–4; p. 184).

1856. *Leachia Reinhardtii*, Stp., Hectocotyl., p. 200.
1861. *Cranchia Reinhardtii*, Stp., Overblik., p. 76.
1884. *Liocranchia Reinhardtii*, Pffr., Ceph. Hamb. Mus., p. 25.

Taonius, Steenstrup, 1861.

Loligopsis, d'Orbigny, Tryon, de Rochebrune, &c.
Desmoteuthis, Verrill
Procalistes, Lankester.
Phasmatopsis, de Rochebrune.
Megalocranchia (*?*), Pfeffer.

1. *Taonius pavo* (Lesueur), Steenstrup.

1821. *Loligo pavo*, Lesueur, Journ. Acad. Nat. Sci. Philad., vol. ii. p. 96, pl.
1839. *Loligopsis pavo*, d'Orb., Céph. acét., p. 321 ; Calmars, pl. vi. (*excl.* fig. 4) ; Loligopsis, pl. iv. figs. 1–8 (*pars*).
1861. *Taonius pavo*, Stp., Overblik, pp. 70, 84.
1882. *Desmoteuthis hyperborea* (*?*), Vll., Ceph. N. E. Amer., p. 302, pl. xxvii. figs. 1, 2 ; pl. xxxix. fig. 1 (*excl. syn.*).
1885. *Taonius pavo*, Hoyle, Loligopsis, p. 318.

2. *Taonius hyperboreus*, Steenstrup (Pl. XXXII. fig. 12 ; Pl. XXXIII. figs. 1–11 ; p. 191).

1861. *Taonius hyperboreus*, Stp., Overblik., p. 83.
1882. *Desmoteuthis tenera* (*?*), Vll., Ceph. N. E. Amer., p. 412, pl. lv. fig. 2 ; pl. lvi. fig. 3.
1885. *Taonius hyperboreus*, Hoyle, Loligopsis, p. 321.

3. *Taonius cymoctypus* (de Rochebrune), Hoyle.

1839. *Loligopsis pavo*, d'Orb., Céph. acét., p. 321 ; Calmars, pl. vi. fig. 4 (*?*) ; pl. xxiii. figs. 10, 11. (*pars*).
1884. *Phasmatopsis cymoctypus*, Rochebr., Monogr. Loligopsidæ, p. 17, pl. i.
1885. *Taonius cymoctypus*, Hoyle, Loligopsis, p. 323.

4. *Taonius suhmi* (Lankester), (Pl. XXXII. figs. 5–11 ; p. 192).

1884. *Procalistes Suhmii*, Lankester, Quart. Journ. Micr. Sci., vol. xxiv. p. 311.

5. *Taonius elongatus*, Steenstrup, MS. (Pl. XXVIII. fig. 13 ; p. 189).

6. *Taonius schneehageni* (Pfeffer).[1]

1884. *Loligopsis Schneehagenii*, Pffr., Ceph. Hamb. Mus., p. 23, fig. 31.

7. *Taonius* (*?*) *maximus* (Pfeffer).[2]

1884. *Megalocranchia maxima*, Pffr., Ceph. Hamb. Mus., p. 24, fig. 32.

Pyrgopsis, de Rochebrune, 1884.

1. *Pyrgopsis rhynchophorus*, de Rochebrune.

1884. *Pyrgopsis rynchophorus*, Rochebr., Monogr. Loligopsidæ, p. 23, pl. ii. figs. 1–6.

[1] Dr. Pfeffer has been good enough to furnish me with a number of additional particulars regarding this form, which leave no doubt that it should be referred to the genus *Taonius*.

[2] If I am correct in referring this form to the genus *Taonius*, the specific designation is singularly unfortunate; *minimus* would have been more appropriate ; but in the present state of our knowledge it is not worth while to burden the animal with another name.

Leachia, Lesueur, 1821 ; Steenstrup, 1861.

Anisoctus (*?*), Rafinesque.
Loligopsis (*pars*), d'Orbigny, Auctt.
Dyctydiopsis, de Rochebrune.
Perothis, Rathke.

1. *Leachia cyclura*, Lesueur.

1821. *Leachia cyclura*, Les., Journ. Acad. Nat. Sci. Philad., vol. ii. p. 90, pl. vi.
1833. *Loligopsis guttata*, Grant, Trans. Zool. Soc. Lond., vol. i. p. 24, pl. ii.
1833. *Perothis pellucida*, Rathke, Mém. Savans Étrang. St. Petersb., t. ii. p. 149.
1833. „ *Escholtzii*, Rathke, *Ibid.*
1861. *Leachia cyclura*, Stp., Overblik, p. 82.
1884. *Perothis Dussumieri*, Rochebr., Monogr. Loligopsidæ, p. 28.
1885. *Leachia cyclura*, Hoyle, Loligopsis, p. 326.

2. *Leachia ellipsoptera* (Adams and Reeve), Steenstrup.

1848. *Loligopsis ellipsoptera*, Ad. and Rv., Voy. "Samarang," Moll., p. 2.
1861. *Leachia ellipsoptera*, Stp., Overblik, p. 80.
1884. *Dyctydiopsis ellipsoptera*, Rochebr., Monogr. Loligopsidæ, p. 18.
1885. *Leachia ellipsoptera*, Hoyle, Loligopsis, p. 328.

3. *Leachia dubia* (Rathke), Hoyle.

1833. *Perothis dubia*, Rathke, Mém. Savans Étrang. St. Petersb., t ii. p. 170.
1885. *Leachia dubia*, Hoyle, Loligopsis, p. 329.

Loligopsis,[1] Lamarck, 1812.

Loligopsis, Auctt. (*pars*).

1. *Loligopsis peronii*, Lamarck.

1812. *Loligopsis Peronii*, Lmk., Extrait de son Cours de Zool., p. 123 (*fide* d'Orb.).
1861. „ „ Stp., Overblik., p. 85.
1885. „ „ Hoyle, Loligopsis, p. 314.

2. *Loligopsis zygæna*, Vérany.[2]

1851. *Loligopsis zygæna*, Vèr., Céph. médit., p. 125, pl. xl. fig. *c*.
1884. *Zygænopsis zygæna*, Rochebr., Monogr. Loligopsidæ, p. 20.
1885. ——— (*?*) *zygæna*, Hoyle, Loligopsis, p. 331.

[1] The true position of this genus is entirely uncertain : the description of the type species, based upon a drawing, is so fragmentary, that nothing can be extracted from it as to the affinities of the animal. See also note p. 20.

[2] This is certainly not a *Loligopsis* in the Lamarckian sense, but at present there is no ground for referring it to any known genus whatever, nor do I think its characters sufficiently well known to enable a new genus to be erected of it ; I therefore leave it as placed by the original describer. The name proposed by de Rochebrune is preoccupied.

Order II. TETRABRANCHIATA, Owen, 1832.

Family XIV. Nautilidæ, Owen, 1836.

Nautilus,[1] Linné, 1757.

1. *Nautilus pompilius*, Linné (p. 199).

1758. *Nautilus pompilius*, Linn., Syst. Nat., ed. x. p. 708; No. 283, 232.
1868. „ „ Küster, Conch. Cab., sec. 55, p. 9, Taf. ii. fig. 2.

2. *Nautilus scrobiculatus*, Solander, MS.

... *Nautilus scrobiculatus*, Sol., Portl. Catal., No. 3653.
1868. „ „ Küster, Conch. Cab., sec. 55, p. 9, Taf. iii. figs. 1, 2.

3. *Nautilus macromphalus*, Sowerby.

1848. *Nautilus macromphalus*, Sow., Thes. Conch., p. 464, pl. xcviii. figs. 4, 5.
1868. „ „ Küster, Conch. Cab., sec. 55, p. 10, Taf. 3a.

4. *Nautilus umbilicatus*, Lister.

... *Nautilus umbilicatus*, Lister, Conch., pl. 552, fig. 4.
1868. „ „ Küster, Conch. Cab., sec. 55, p. 10, Taf. 3c. fig. 2.

5. *Nautilus stenomphalus*, Sowerby.

1848. *Nautilus stenomphalus*, Sow., Thes. Conch., p. 469, pl. xcvii. fig. 3.
1868. „ „ Küster, Conch. Cab., sec. 55, p. 11, Taf. 3b.

[1] Having no sufficient personal knowledge of the different species of this genus I have followed Küster (*loc. cit.*) in their enumeration; what study I have had the opportunity of giving them leads me to think that they may, perhaps, be reducible to two species, *Nautilus pompilius*, Linn., and *Nautilus umbilicatus*, Lister, with a number of more or less well marked varieties.

EXPLANATION OF THE MORE ABBREVIATED REFERENCES.

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Japanska Cephalopoder, *K. Svensk. Vetensk. Akad. Handl.*, Bd. xxi. No. 13, pp. 1–40, pls. i.–iii., 1886.

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A Descriptive Catalogue of Recent Shells arranged according to the Linnæan Method, with Particular Attention to the Synonymy. London, 1817.

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Voy. "Bonite."

Voyage autour du Monde exécuté pendant les années 1836 et 1837, sur la corvette la Bonite, commandée par M. Vaillant.—Zoologie, t. ii. Paris, 1852.

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Moll. Wilkes Exped.

United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842, under the Command of Charles Wilkes, U.S.N.—Vol. xii., Mollusca and Shells. Boston, 1852.

Gray, John Edward.

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Diagnoses of new Species of Cephalopoda collected during the Cruise of H.M.S. Challenger.—Part I. The Octopoda. *Ann. and Mag. Nat. Hist.*, ser. 5, vol. xv. pp. 222–236, 1885.

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Loligopsis.

On Loligopsis and some other genera. *Proc. Roy. Phys. Soc. Edin.*, vol. viii. pp. 313–333, 1885.

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Malacol. Mar Rosso.

Malacologia del Mar Rosso, ricerche zoologiche e paleontologiche. Pisa, 1869.

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Jahresbericht der Commission zur wissenchaftlichen Untersuchung der deutschen Meere in Kiel, Jahrgang i., &c., 1871, &c. Berlin, 1873, 1878.

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Ind. Moll. Groenl.

Index Molluscorum Groenlandiæ. *Krøyer, Nat. Hist. Tidsskr.*, Bd. iv. pp. 76–97, 1843; also (paged separately) Hafniæ, 1842.

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Voyage dans l'Amérique méridionale exécuté pendant les années, 1826, 1827, 1828, 1829, 1830, 1831, 1832, et 1833.—Tom. v. partie 3, Mollusques. Paris et Strasbourg, 1835–1843.

Moll. viv.

Mollusques vivants et fossiles. Paris, 1845 and 1855.

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Historie physique, politique et naturelle de l'Ile de Cuba, par M. Ramon de la Sagra.—Mollusques par Alcide d'Orbigny. Paris, 1853.

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(Some of the plates of this work appear to have been issued prior to this date, for d'Orbigny quotes species as having been published in them as early as 1825.)

PFEFFER, G. (Pffr.).

Ceph. Hamb. Mus.

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Zoologie du Voyage de l'Astrolabe, sous les ordres du Capitaine Dumont d'Urville, pendant les années 1826–29, t. ii. Paris, 1832.

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Étude monographique de la famille des Loligopsidæ. *Bull. Soc. philom. Paris*, sér. 7, t. viii. No. 1, pp. 7–28, pls. i., ii., 1884.

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(Translation by W. S. Dallas. *Ann. and Mag. Nat. Hist.*, ser. 2, vol. xx. pp. 81–114, 1857.)

Coloss. Blækspr.

Oplysninger om Atlanterhavets colossale Blæksprutter. *Skand. Naturf. Forhandl.*, vii. Möde, pp. 182–185, 1856.

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Overblik over de i Kjöbenhavns Museer opbevarede Blæksprutter fra det aabne Hav. *Oversigt K. D. Vid. Selsk. Forhandl.*, pp. 69–86, 1861.

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Hemisepius, en ny Slægt af Sepia-Blæksprutternes Familie, med Bemærkninger om Sepia-Formerne i Almindelighed. *K. dansk. Vidensk. Selsk. Skriv.*, Rk. 5, Bd. vii. pp. 465–482, pls. i., ii., 1875.

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Professor A. E. Verrils to nye Cephalopodslægter: Sthenoteuthis og Lestoteuthis. *Oversigt K. D. Vid. Selsk. Forhandl.*, pp. 1–27, pl. i., 1880.

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Also Descriptions of Two Species of Octopus from California, No. 6, pp. 117–124, pls. iv.–vi., 1883.

Ceph. N. E. Amer.

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(In references to the pages and plates, the former of these places is quoted as having been first published, in addition to which the index attached to the Fish Commission Report renders the indication of pages in it less necessary.)

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Third Catal.

Third Catalogue of Mollusca recently added to the Fauna of the New England Coast and the adjacent parts of the Atlantic, consisting mostly of Deep-Sea Species, with Notes on others previously recorded. *Trans. Connect. Acad.*, vol. vi. part 2, pp. 395–452, pls. xlii.–xliv., 1885.

DESCRIPTIONS OF GENERA AND SPECIES.

Every one who, within the last few years, has attempted the task of identifying a considerable collection of Cephalopoda must have felt great difficulty in deciding what forms were to be regarded as new; a result mainly owing to the brevity and insufficiency of the published descriptions of a large proportion of the hitherto known species. Taking warning by such experiences I have endeavoured to bequeath to my successors as little trouble in this respect as may be, though I cannot hope that there will not come a time when the diagnoses given below will be found inadequate to the requirements of the day. I have endeavoured, without being unduly prolix, to make mention of every feature in the appearance of the animal which could be of systematic significance, whether I have myself thought it of much importance in that respect or not.

The specimen has been invariably placed for descriptive purposes in a position, indicated in the annexed woodcut (Fig. 1), which agrees with what may be called the

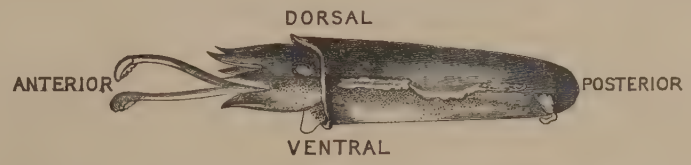

FIG. 1.—Lateral view of a *Sepia*, showing the position in which the specimen is placed for description.

"morphological disposition" adopted by Lankester,[1] if the inclination to the horizontal, which is inconvenient for practical purposes, be neglected. In speaking of the arms, the side which is turned towards the mouth and bears the suckers has been called the "inner" and the opposite the "outer," and the same terms have been applied to the two surfaces of the interbrachial membrane or "umbrella." "Breadth" has always been used to signify a transverse measurement, and "length" a measurement parallel to the longitudinal axis of the animal, although, as in the fins of *Cirroteuthis*, the former may greatly exceed the latter. Several structures, to whose systematic value attention has been called by Steenstrup, have been called by translations of his names; thus "Hæftepuder" has been rendered by "fixing cushions." Other names which have been adopted for the parts of the shells of *Sepia* and for other structures will be explained as they arise.

[1] Ency. Brit., vol. xvi. p. 664, 1884.

Furthermore the attempt has been made to render the descriptions as easy of reference as possible, by arranging each in a series of uniform paragraphs and taking up the organs in a definite order.

Dimensions have been given in the case of new species, although, except as indicating general proportions, I do not attach much value to them, owing to the great contractility of the animals when alive, and to the irregular manner in which they sometimes seem to be affected by reagents.

It may be a matter of astonishment to some that no stress has been laid upon the radula in the comparison of different species. When the examination of the present collection was first commenced, drawings were made of this organ, and it was intended to publish and use them for diagnostic purposes, but it became evident in a short time that without a much more extended investigation than was possible under the circumstances no results of value could be hoped for. It appears that in almost every radula each row of teeth differs a little from the one preceding it, and very frequently five, six, or even more rows must be examined before a given form repeats itself; two rows of teeth from the same specimen will often differ as much as two from different species. From this it was evident that the majority of the figures hitherto published were valueless for comparative purposes, inasmuch as they show only one row of teeth, and it appeared wiser to defer the consideration of this particular organ, in the hope of making a thorough examination of the whole matter with larger material at some future date.

Class CEPHALOPODA, Cuvier.

Siphonopoda, Lankester.

Order I. DIBRANCHIATA, Owen.

Suborder I. OCTOPODA, Leach.

Division 1. Lioglossa, Lütken.

Family I. Pteroti, Reinhardt et Prosch.

Cirroteuthidæ, Keferstein.

Cirroteuthis, Eschricht.

Sciadephorus, Reinhardt et Prosch.
Bostrychoteuthis, Agassiz.

The history of this genus has been rather remarkable. Founded in 1836 by Eschricht for the reception of a single species, it underwent no enlargement for nearly fifty years, until, in fact, the dredgings of the "Talisman" gave Dr. Fischer materials for the description of a second species; whilst during the past year no less than five additional forms have been added, three obtained by the Challenger and two by the U.S. steamer "Albatross."

This sudden increase in our knowledge of the genus is coincident with the extensive prosecution of deep-sea dredging, and, as will be explained in the sequel (p. 231), furnishes one argument for regarding *Cirroteuthis* as an abyssal genus.

It is of course possible that some two or more of these forms may belong to the same species, for at present we have but slender means of ascertaining the amount of variation in this genus. As specific characters I have relied upon the form of the internal cartilage, the presence or absence of an "intermediate web," the position on the arm at which the cirri commence and cease, and the presence or absence of a tubercle or indurated tract at the junction of the web with the arms, which will be described further on.

Desiring to avoid as far as possible the danger of creating unnecessary species, I sent drawings and descriptions of those proposed to Dr. Paul Fischer for comparison with his type specimens, concerning which he writes,—"J'ai comparé avec soin vos figures avec les types de *Cirroteuthis umbellata*, et aucun d'eux ne se rapporte à mon espèce, dont

la terminaison des bras est differente, et dont les cirrhes sont beaucoup plus courts, et dont les nageoires sont aussi plus courtes et plus arrondies."

We have no reliable information as to the habits of the genus, and the Challenger material yielded none even as to its food, for several specimens were in such a fragmentary condition that no stomach was forthcoming, and in the other cases it was empty, and the intestine contained only a pulpy mass in which no structures could be distinguished. It may be conjectured that the enormous web serves as a kind of fishing-net, and that the cirri placed between the suckers are tactile in function. It seems also worth while to suggest that possibly the cirri may by their vibration create a current passing down the arms to the mouth, thus procuring a supply of food as is also the case with the Rotifer *Stephanoceros*. Unfortunately also not one of the specimens of *Cirroteuthis* collected by the Challenger is in a fit state for dissection, for the soft consistency of the tissues of these animals renders them exceedingly sensitive to reagents, and the amount of material to be dealt with on board the ship was so great that it was impossible to give to such delicate organisms the care they required. It is interesting to note, however, that no radula could be found, as is also the case in *Cirroteuthis müllleri*.

Cirroteuthis magna, Hoyle (Pl. XI. figs. 3–5; Pl. XII.; Pl. XIII. figs. 1–4).

1876. *Cirroteuthis* sp., Suhm, Challenger Briefe, vi., Zeitschr. f. wiss. Zool., Bd. xxvi. p. lxxx.
1885 „ *magna*, Hoyle, Diagnoses I., p. 233.
1885. „ „ Hoyle, Prelim. Rep. I., p. 109.

Habitat.—Station 146, between Prince Edward Island and the Crozets, December 29, 1873; lat. 46° 46′ S., long. 45° 31′ E.; 1375 fathoms; Globigerina ooze. One specimen.

Station 298, off Valparaiso, November 17, 1875; lat. 34° 7′ S., long. 73° 56′ W.; 2225 fathoms; blue mud. One mangled specimen.

The Body is oblong, about twice as long as broad, and rather broader than deep. The *mantle-opening* is circular, but little larger than the base of the siphon, and its margins are continuous with two ridges on the sides of the latter. The *siphon* is conical, and slightly swollen at the tip; it is not connected to the head by ligaments. The *fins* are obovate in form, about four times as broad as long, and thickened along the posterior margin. The *dorsal cartilage* (Pl. XIII. figs. 1, 2) is saddle-shaped, and elongated from side to side, not antero-posteriorly.

The Head is directly continuous with, and somewhat narrower than the body; the *eyes* are spheroidal, the lens spherical, and the palpebral opening circular.

The Arms are subequal, three and a half to four times as long as the body; they are slender, and more resemble thickenings of the web than independent arms; they are

thickest about two-thirds the distance from their base, and terminate in a delicate slender tip, which projects beyond the web. The *umbrella* is a thin delicate membrane, very largely developed, and when fully expanded probably forming a cup nearly three times as large in diameter as in depth. It extends from the tip of the ventral arm on either side backwards, and becomes gradually narrower, so that it only extends along the proximal two-thirds of the next arm, and passes beneath it to be attached in a crescentic line to the outer surface of the web, which similarly passes backwards from the tip of this (Pl. XII. fig. 1): this condition is usually described by saying that the arm does not lie in the umbrella for the proximal two-thirds of its length, but is joined to it by a vertical or "intermediate" web, but this does not so correctly represent the arrangement. The umbrella stretches across from tip to tip of the two dorsal arms, and between the proximal two-thirds of the two ventral arms (see woodcut 2). The web is thickened but not indurated where it is attached to the ventral aspect of the arms. The *suckers* commence about 1 cm. from the oral margin, and the first four lie pretty close together within a space of less than 2 cm., after which they gradually become further separated, an interval of 2–3 cm. intervening between each two; about two-thirds along the arm they stand closer together, and are very large, but after this they again become smaller, and stand in close contiguity with each other. The proximal suckers are small, prominent, and rather soft, and seem to contract by folding the lateral margins over towards each other, so as to present the appearance of a half-closed eyelid; the largest suckers are firm and muscular, and consist of a hollow globular basal portion imbedded in the arm and a short cylindrical or conical projecting portion. They are divided internally also into two parts, the outer being a shallow cup leading by a narrow aperture into a rounded cavity below. The *cirri* commence between the fourth and fifth suckers as very minute prominences, which gradually increase in length until halfway along the arm they attain a maximum length of 8 cm., after which they decrease rapidly, and cease opposite the attachment of the web to the ventral aspect of the arm.

The Surface of the body has been entirely denuded of epidermis, so that it is impossible to ascertain its nature; the web is perfectly smooth.

The Colour, so far as preserved, is a dull madder; an entry in v. Willemoes-Suhm's manuscript journal states that it was "rose" when captured.

The Jaws are shown in Pl. XII. figs. 6, 7.

Dimensions.

Length, total,	1155 mm.
End of body to mantle-margin,	163 „
End of body to eye,	175 „
Breadth of body,	125 „
Breadth of head,	about 100 „
Eye to root of fin,	126 „
Length of fin,	76 „
Breadth of fin (extreme),	513 „
Breadth of intermediate web,	180 „
Diameter of largest sucker,	8 „
Length of longest cirri,	80 „
Breadth of dorsal cartilage,	100 „
Length (greatest antero-posterior),	50 „
„ (median),	20 „
Thickness (dorso-ventral),	20 „

	Right.	Left.
Length of first arm,	875 mm.	875 mm.
Length of second arm,	870 „	875 „
Length of third arm,	870 „	890 „
Length of fourth arm,	838 „	915 „
Length of free tip of arms,	about 30 „	30 „
Suckers on first arm,	103 „	80 „
Suckers on second arm,	83 „	88 „
Suckers on third arm,	103 „	102 „
Suckers on fourth arm,	84 „	85 „

The species just described is based upon only two specimens; the smaller is in a very fragmentary condition, but the larger is of special interest as being, so far as I am aware, by far the largest of the genus hitherto known; the fine series of *Cirroteuthis mülleri* in the Copenhagen Museum contains none more than 40 cm. in extreme length.

Still larger dimensions must, however, be sometimes attained by the genus, as is proved by the suckers which were removed from a dead specimen floating on the surface, and which measured nearly twice as much in diameter as those of the present individual (see p. 66).

The arrangement of the web needs perhaps a little further description. Commencing with the portion between the two dorsal arms, it extends almost up to their extremities, only a very slender tapering portion projecting beyond it (Pl. XII. fig. 2, and woodcut 2). The arms themselves appear to be thickenings of the margin of the web for the reception of the suckers, rather than independent structures; they are about 25 mm. wide, thickened at the free margin where the suckers are inserted, and becoming gradually thinner as they pass into the web. A curved line (*i*, *i*, woodcut 2) may be seen passing along the membrane on either side from near the mouth to a point about two-thirds up the arm; this line is the attachment of the web extending between the dorsal and dorso-

lateral arms of either side, which is affixed to the outer surface of the web above described, and in its turn passes to within 30 mm. of the extremity of the dorso-lateral arm. Its margin is thickened where it is attached to the dorsal arm (Pl. XII. fig. 3); this thickening corresponds to the hardened tract forming this part of the margin of the web in *Cirroteuthis mülleri*, but there is no trace of anything horny or cartilaginous in its constitution in the present species.

The membrane is attached in a precisely similar way to each two successive arms, producing, when looked at from the anterior end of the animal, the figure shown in woodcut 2, A.

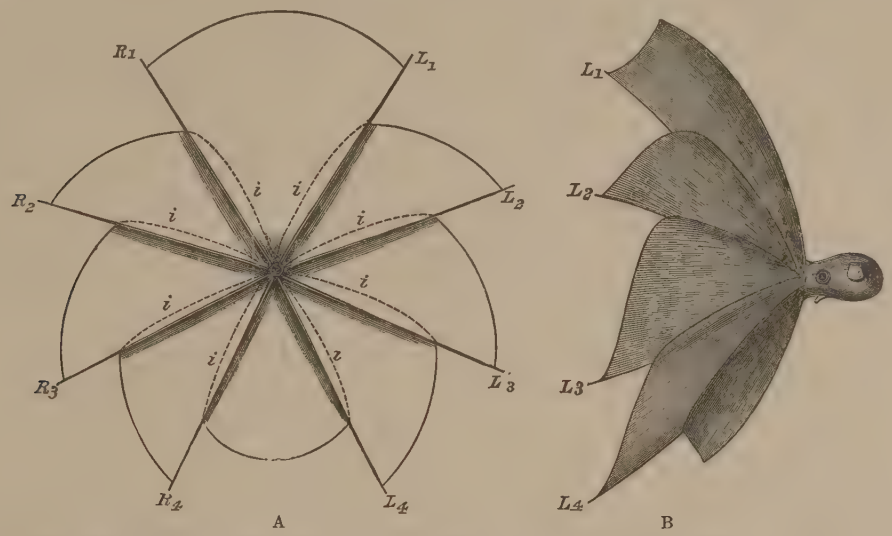

FIG. 2.—Diagrammatic figures of *Cirroteuthis magna*, drawn to a scale of about one-twentieth, to show the form and arrangement of the umbrella. A, seen from the anterior aspect; B, from the left hand side; R_1-R_4, L_1-L_4, the arms of the right and left sides respectively; *i*, *i*, the lines indicating the attachment of one web to the other.

The effect of this arrangement is that when the umbrella is extended the arms do not lie in its plane, but each is separated from it by the portion of web lying between the arm and the curved line alluded to above; this may be conveniently called the "intermediate" web.

Measurements of the different parts of the web led to the following conclusions as to its form when fully expanded. The perimeter of the margin must have been about 450 cm., the distance between the tips of the two dorsal arms being 80 cm., between the two ventral 62 cm., while the distances between the remaining pairs varied from 46 to 54 cm.

The radius of the circle in which the tips of the arms lie would thus be about 72 cm., and taking the average length of an arm at 87 cm., and assuming them to be quite extended or but slightly curved, the mouth would then be about 60 cm. behind the plane of the tips of the arms. The web itself, however, would form deep pouches between the

several arms owing to the presence of the intermediate web, and might render the whole apparatus a very effective fishing-net.

The dorsal cartilage (Pl. XIII. figs. 1, 2) may be described as saddle-shaped; it is narrow, thick, and rises up into a prominent angle on the dorsum, while the two sides are flattened out into obovate expansions, which are more prominent anteriorly than posteriorly. A thick semi-cartilaginous membrane is attached all round the dorsal surface, and appears to have been reflected over it, and thus to have enclosed a narrow cavity above the cartilage: in *Cirroteuthis mülleri* a similar membrane seems to have overlapped the posterior surface and to have formed a cavity there.[1] This organ is widely different in form from that of *Cirroteuthis mülleri* as may be seen at once on comparing Pl. XIII. figs. 1, 2, with the figures in Reinhardt and Prosch's Memoir. In both instances, however, the cartilage is entirely free from the sac in which it lies, and the bases of the fins rest upon it near the extremities of the lateral expansions.

The mangled specimen from Station 298 was at first referred to *Stauroteuthis*, but with very great hesitation; firstly because of its lacerated condition, and secondly in consequence of doubts as to the validity of the genus.

In Verrill's definition there are but few points mentioned which seem to me of generic importance, and of these a large proportion are also common to *Cirroteuthis*, for instance, the opening sentence—"Allied to *Cirrhoteuthis*, but with the mantle united to the head all around, and to the dorsal side of the slender siphon, which it surrounds like a close collar, leaving only a very narrow opening around the base of the siphon, laterally and ventrally"[2]—is quite misleading, and would not have been written if the author had had the opportunity of examining a specimen of *Cirroteuthis* in good condition, for he would then have seen that these characters, upon which he relies for distinction, are common to both genera; the mistake has no doubt arisen from his having had for comparison only the figures of Eschricht,[3] which exhibit the mantle as gaping widely open and exposing the gills; a condition only seen in specimens whose tissues have become loosened and stretched in consequence of defective preservation. The excellent drawing of the animal in a living condition by Madame Rudolph, published by Reinhardt and Prosch,[4] would have shown Professor Verrill the true state of the case, especially when taken in conjunction with their clear description of the arrangement:—"Head and body are united to the greatest extent possible, so that there only remains a horse-shoe-shaped aperture closely surrounding the funnel in the ventral median line" (*op. cit.*, p. 11).[5]

The points which are really diagnostic between the two genera, if only reliance can be placed upon them, are the following:—(1) "Dorsal cartilage forming a median

[1] Om Sciadephorus Mülleri, tab. iii. figs. 1, 2, 3.

[2] Ceph. N. E. Amer., p. 382.

[3] *Nova Acta Acad. Cæs. Leop.-Carol.*, tom. xviii., tab. xlviii.

[4] Om Sciadephorus Mülleri, tab. i.

[5] Professor Steenstrup, who gave Dr. Rudolph a preliminary acquaintance with the Mollusca of Greenland before his departure to that country, tells me that this account of the form of the mantle-opening was confirmed by Dr. and Madame Rudolph in conversation with him.

angle, directed backward,"[1] and (2) the fact that the web is attached to an equal extent both to the dorsal and ventral aspects of the arms.[2]

With regard to the former of these matters I am inclined to doubt its value, because in the case of *Cirroteuthis meangensis* I found a young individual with the cartilage disposed as in *Stauroteuthis*, while in a larger one it was placed in the usual manner. Furthermore, the examination of the specimens of *Cirroteuthis mülleri* in the Zoological Museum at Copenhagen led me to the conclusion that the cartilage was liable to considerable displacement by the unequal contraction of so soft and loosely compacted a body when immersed in alcohol, and that an observer who had only one specimen for investigation might easily be deceived as to its original position.

As to the latter point, it constitutes, to my mind, the chief diagnostic character of *Stauroteuthis*, if it be proved to exist. It may seem gratuitous to hint that so careful an observer as Professor Verrill may have made a mistake in such a matter as the attachment of the web to the arms, but he does not record the absence of the usual inequality, and it is a point which, unless exaggerated, as in the case of *Cirroteuthis magna*, is not very striking, and is also one which has been observed in every specimen examined with a view to ascertaining its existence. More explicit information as to this point, and as to the form of the internal cartilage, would be very acceptable to teuthologists.

The specimen under discussion was at first referred to *Stauroteuthis*, because, although the web was much lacerated, it appeared as though it could be traced almost to the extremities of the arms, and that name (with a query) was affixed to the drawing (Pl. XI. fig. 3), in which also the margin of the web was "restored" in agreement with this view as to the affinities of the animal. Since the cartilage has been extracted, however, and has been compared with that of *Cirroteuthis magna*, it has been found to present a most decided agreement with it (compare Pl. XIII. figs. 1, 2, and 3, 4), and a renewed examination of the arms and the fragments of the web has shown that the appearances previously relied upon were deceptive, so that there seems now every reason to regard this specimen and the larger one as conspecific.

Cirroteuthis pacifica, Hoyle (Pl. X.).

1885. *Cirroteuthis pacifica*, Hoyle, Diagnoses I., p. 235.
1885. „ „ Hoyle, Prelim. Rep. I., p. 112.

Habitat.—Station 181, off the south-eastern extremity of Papua, August 25, 1874; lat. 13° 50′ S., long. 151° 49′ E.; 2440 fathoms; red clay. One mutilated specimen.

The Body is almost entirely absent. The *fin* is obovate in form, and thickened along the posterior margin, thin and membranous at the extremity and along the anterior

[1] Ceph. N. E. Amer., p. 382. [2] *Op. cit.*, pl. xxxii.

margin (fig. 3). The *mantle-opening* is horse-shoe-shaped, and closely embraces the base of the *siphon*, which is long, thin, and conical (fig. 3).

The Head is exceedingly short, and the *eye* appears to occupy all the available space between the fin and the arms.

The Arms are subequal, thick, rounded, and soft, and taper rapidly towards the extremities. The *umbrella* is attached directly to the arms, which are somewhat more prominent on its inner than on its outer surface; it is attached to the dorsal aspect of every arm almost to the tip, and to the ventral aspect for somewhat more than half its length, and at this latter attachment is a firm nodule of cartilaginous consistency (fig. 2). The *suckers* are about fifty-two in number, and commence close to the oral lip, and the first half-dozen stand near together; halfway up the arms they are farther apart, and the largest are situated opposite the attachment of the membrane to the ventral aspect of the arms; they are prominent, but not so hard and firm as those of *Cirroteuthis magna:* there are faint radial markings upon them. The *cirri* commence on the dorsal arms between the seventh and eighth suckers, and continue till the last; on the ventral arms they commence between the sixth and seventh, and here also are continued to the tips of the arms; they begin as small papillæ, and gradually increase in length, attaining the maximum about halfway along the arms.

The Surface is smooth.

The Colour is a deep purplish-madder, paler outside the umbrella and on the fin.

The Jaws are shown in Pl. X. figs. 4, 5.

Dimensions.

Length of fin,	15 mm.
Breadth of one fin from origin to tip,	55 „
Length of siphon,	15 „
Diameter of largest sucker,	2·5 „
Length of longest cirri,	5 „

	Right.	Left.
Length of first arm,	170 mm.	145 mm.
Length of second arm,	140 „	155 „
Length of third arm,	130 „	140 „
Length of fourth arm,	150 „	135 „

The only specimen representing this species is sadly mutilated; the whole body has been removed, leaving only one fin, one eye, and the siphon. It is readily distinguished from the last by the much greater thickness and solidity of the arms and the smaller comparative size of the suckers, and by the fact that the web is very narrow between the several arms, and does not admit of their being widely separated (this may be due to the action of the spirit); it is attached directly to each side of the arms, one web not being joined to the other so as to constitute an intermediate web. As in that form, however, it

passes to the tip of the arm on the dorsal aspect, and only about two-thirds up it on the ventral.

On the ventral side of each arm, just where the margin of the umbrella is attached, is a peculiar ovoid nodule of cartilaginous consistency projecting inwards, somewhat paler in colour than the surrounding tissue (see Pl. X. figs. 1, 2). This is obviously homologous with the thickening of the margin of the web in *Cirroteuthis mülleri*, alluded to above, and I have no doubt that it is of a similar nature to the structure described by Verrill in the case of his *Cirroteuthis megaptera*.[1] In that case, however, the organ seems to have been long and tentacular instead of being a mere nodule. I do not feel able to suggest any function for these structures, other than that they serve to strengthen the web at its attachment to the arm where it would naturally run the greatest risk of being torn. I do not think that their arrangement in this species lends any support to Verrill's view that "it may, perhaps, correspond to one of the transverse supports of the marginal membranes of *Sthenoteuthis* and *Ommastrephes*," but should rather be disposed to agree with Professor Steenstrup who regards them as comparable to the thickened margin of the web-like expansion of the third pair of arms of *Ommastrephes*. In any case it is interesting to see here a stage in the evolution of the more complete organ, which he has described, another step being represented by the still less pronounced nodule observed in the next species.

The proximal end of the cartilage of the fin was exposed and presented a long grooved articular surface; the one branchia which remained was similar to that of *Cirroteuthis mülleri*, presenting the appearance of a spheroidal nodule with meridional grooves, and looking not unlike an *Oniscus* when rolled up.

Cirroteuthis meangensis, Hoyle (Pl. IX. figs. 12, 13; Pl. XI. figs. 1, 2; Pl. XIII. figs. 5, 6).

1876. *Cirroteuthis* sp., Suhm, Challenger Briefe VI., Zeitschr. f. wiss. Zool., Bd. xxvi. p. lxxx.
1885. „ *meangensis*, Hoyle, Diagnoses I., p. 234.
1885. „ „ Hoyle, Prelim. Rep. I., p. 111.

Habitat.—Station 214, off the Meangis Islands, February 10, 1875; lat. 4° 33′ N., long. 127° 6′ E.; 500 fathoms; blue mud. One specimen.

Station 171, north of the Kermadec Islands, July 15, 1874; lat. 28° 33′ S., long. 177° 50′ W.; 600 fathoms; hard ground. One immature specimen.

The Body is much distorted, but appears to have been subglobular in form. The *mantle-opening* is very small, and fits closely around the base of the *siphon*, which is small and bluntly conical, with a still smaller pimple-like extremity; on either side there extends from the dorso-lateral base a curved fold of membrane, which loses itself in the

[1] Third Catal., p. 407.

mantle. The *fins* are about equal in length to the breadth of the body, narrow and pointed at the extremity, and thickened towards the posterior margin, and just above the root of each is a *pore* of unknown function. The *dorsal cartilage* is much elongated transversely, and is curved almost into the form of a horse-shoe (Pl. XIII. fig. 5).

The Head is exceedingly short, and the *eyes* large and spheroidal.

The Arms are subequal, and about three times as long as the body in the present shrunken condition of the specimen; they taper rather rapidly to slender points. The *umbrella* extends on the dorsal side of each arm to within 1 cm. of its extremity, whilst on the ventral side it reaches only four-fifths along it; the arms lie in the umbrella, and are not united to it by any intermediate or vertical web. The *suckers* are about sixty to seventy in number, small and subequal; they are at equal intervals for the greater part of the arm, but closer near the extremity. The *cirri* are short, stout, and conical, the largest 2 mm. in length; on the ventral arms they commence between the fourth and fifth suckers, and extend to the fiftieth sucker, beyond which there are twenty-one suckers, which gradually decrease; on the dorsal arms the cirri commence between the sixth and seventh suckers, and continue to the fifty-fifth, beyond which there are nine suckers.

The Surface is smooth.

The Colour of the body is creamy white, of the arms and umbrella deep madder-brown. The suckers and cirri are paler.

Dimensions.

Breadth of body,	30 mm.
Length of fin,	10 „
Breadth of one fin,	30 „
Diameter of largest sucker,	1 „
Diameter of eye,	12 „

	Right.	Left.
Length of first arm,	100 mm.	100 mm.
Length of second arm,	94 „	100 „
Length of third arm,	80 „	92 „
Length of fourth arm,	90 „	92 „

This species is closely allied to the last, the web being attached directly to either side of each arm, so that there is no intermediate web, whilst it passes nearly to the tip on the dorsal but only about four-fifths upon the ventral aspect; furthermore, at the junction with the arm on this side there is a small papilla, but this, besides being smaller, is more intimately connected with the arm, and lies less in the web than in the case of *Cirroteuthis pacifica;* it is marked by a ridge which is a continuation of the margin of the umbrella (Pl. XI. fig. 2); the cirri too, instead of ceasing where the membrane terminates on the ventral aspect of the arm, are continued almost, if not quite, to its extremity. The two species differ in the form of the funnel, in the presence of the pore above mentioned, and the cirri

commence one or two suckers farther from the mouth, but it is not certain how much importance is to be attached to this point.

In connection with the capture of this species I find the following note in Dr. v. Willemoes-Suhm's MS. Journal. "Cirroteuthis.—By us this genus . . . . has been found before in deep water several times, especially in the Antarctic," alluding no doubt to the specimens above described as *Cirroteuthis magna* and *Cirroteuthis pacifica*. Furthermore, in his "Challenger Briefe" (*loc. cit.*) he remarks, "Ich möchte glauben, dass das Thier wie die Umbellularia im hohen Norden das Flachwasser erreicht, ... im übrigen aber überall in grossen Tiefen bei niedrigen Temperaturgraden anzutreffen ist," a supposition which we shall afterwards see to be remarkably borne out by all we know of the distribution of the genus (see section on Distribution, *postèa*).

The dorsal cartilage (Pl. XIII. figs. 5, 6) resembles that of *Cirroteuthis magna* rather than of *Cirroteuthis mülleri*, but the peculiar transversely elongated and curved shape of the former is here greatly exaggerated. It consists, indeed, of a thin rod bent round almost into the shape of a horse-shoe: the inner surface of the curve is rounded off, whereas the outer is flat except for four little angular processes, which protrude from it on the anterior and posterior edges about halfway between the centre and the extremities of the curve. Just outside these processes is a slightly flattened area which receives the base of the fin, and forms a kind of socket for it.

The interesting little specimen shown enlarged about four diameters on Pl. IX. figs. 12, 13, may, owing to its complete state of preservation, be supposed to give a better idea of the general form of the body than any other in the collection.

The arms are bent sharply outwards, probably owing to the contraction caused by the alcohol, and for the same reason, as well as because the web on their dorsal side extends quite to the tips, they are drawn upwards at their extremities. They have each about thirty suckers, and the cirri appear as minute papillæ beside and alternating with them.

The head measured across the eyes is the widest part of the body, and just behind these, and slightly to the ventral side of them, are the fins, which arise by narrow rounded peduncles, and become flattened and expanded distally. The funnel is placed anteriorly to the eyes and curves downwards, the mantle-margin fitting closely round its base.

The posterior extremity of the body presents several interesting points for consideration: it is flattened from above downwards, thus terminating in a subacute edge, and this marginal portion seems to consist entirely of the internal cartilage with the integuments stretched tightly over it. The form of the skeleton thus revealed very closely resembles that of *Cirroteuthis meangensis* above described, the angular prominences shown in Pl. XIII. fig. 5, being quite distinctly traceable (they are not quite sufficiently indicated in Pl. IX. fig. 12). It is very singular that this cartilage is curved in the

horizontal plane in which lies the longitudinal axis of the body, whereas in the specimen which I take to be an adult of the same species, it lies in a vertical plane. The significance of this point has been already alluded to whilst discussing the genus *Stauroteuthis* (p. 61).

This specimen has been referred to *Cirroteuthis meangensis*, chiefly on account of the dorsal cartilage, but partly also from the presence of papillæ at the junction of the web with the ventral aspect of the arms, though this character would not distinguish it from *Cirroteuthis pacifica*.

Cirroteuthis sp. (Pl. IX. figs. 10, 11).

Habitat.—South Pacific Ocean, 20° W. of Patagonia, November 6, 1875.

Concerning this specimen, Mr. Murray's MS. journal has the following note:—"On the 6th we passed a large blubber. The dingy was lowered, and I went away in it to pick it up. It turned out to be part of an immense cuttle-fish, *Cirroteuthis*. The body was gone as it had been eaten by some animal, only the arms and mouth parts remained."

The portions which came into my hands consisted of three suckers, one of which had a small fragment of the integument of the arm attached to it (fig. 10). There is nothing to indicate from what part of the arm they were taken, but it is most likely that the largest suckers available would be selected for removal, and on the assumption that such was the case they would show that the animal was of considerably greater dimensions than the specimen of *Cirroteuthis magna*. In that form the largest suckers are situated about two-thirds along the arms, and measure 8 mm. in diameter, while the largest of the present three was about 12 mm. in diameter; it would be unsafe to assume that all the dimensions of the animals were proportional to the diameters of the suckers, but it seems fair to suppose that this specimen attained a length of not less than 1·5 metres.

A section of one of the suckers shows it to consist of a firm muscular shell, which is embedded in the substance of the arm, and is somewhat less than 1 mm. thick. The cavity is subdivided by a circular ridge, the outer portion being the proper suctorial disk, the margins of which are in this instance incurved, so that it appears to form part of the general cavity.

The suckers present no characteristic structure nor peculiar markings which could serve to establish satisfactorily either the specific identity of this form with, or its difference from, any of the preceding ones.

Family II. Amphitretidæ, n. fam.

Amphitretus,[1] Hoyle.

This genus possesses the character, unique amongst Cephalopoda, of having the mantle fused with the siphon in the median line, so that there are two openings into the branchial cavity, one on either side, whence the name.[2] Since only one species is at present known, it is unnecessary to give a more detailed generic diagnosis.

Amphitretus pelagicus, Hoyle (Pl. IX. figs. 7–9).

1885. *Amphitretus pelagicus*, Hoyle, Diagnoses I., p. 235.
1885. „ „ Hoyle, Narr. Chall. Exp., vol. i. p. 271, fig. 106.
1885. „ „ Hoyle, Prelim. Rep. I., p. 113, woodcut.

Habitat.—Station 170, off the Kermadec Islands, July 14, 1874; lat. 29° 55′ S., long. 178° 14′ W.; 520 fathoms; volcanic mud. One specimen, sex (?).

The Body is short, rounded, of gelatinous consistency, and semitransparent. The *mantle* adheres to the sides of the siphon, so that the *mantle-opening*, which is single in all other known Cephalopods, is here divided into two pocket-like openings, which lie one beneath each eye, and extend less than halfway to the *siphon*, which is very long and narrow, and extends forwards anteriorly to the margin of the mantle, for a distance almost equal to the length of the body, and is a little swollen at the extremity.

The Head is indistinguishable from the body, except by the possession of the *eyes*, which are situated near together on the dorsal surface; they consist of a larger basal spheroid, through the walls of which pigment is clearly visible, upon which stands a smaller very prominent spheroid, white, opaque, and of glistening surface.

The Arms are equal, and rather more than twice as long as the body; they are slender, and taper at first gradually and then more rapidly to comparatively blunt points. The *umbrella* extends more than two-thirds up the arms, and is thin, delicate, and transparent (much damaged in the present instance). The *suckers* are firm, muscular cups embedded in the softer tissue of the arms, as in *Cirroteuthis;* there are about twelve placed at some distance apart on that portion of the arm up which the web extends, and eleven closely set, and showing a tendency to biserial arrangement on the free extremities. There are no *cirri*, nor is there any trace of the formation of a *hectocotylus.*

[1] ἀμφίτρητος, with double entrance.

[2] Functionally, if not structurally, this arrangement may be compared with the median septum which is found in the branchial cavity of *Octopus*, *Eledone* and other genera, and is seen carried almost to the margin of the mantle in *Alloposus mollis*, Verrill (Ceph. N. E. Amer., pl. l. figs. 1, 2).

The Surface appears to have been quite smooth originally; there is no sign of any cirri or warts.

The Colour is a dull yellow, apparently due to preservation in picric acid, and the mantle and umbrella are thickly sprinkled with small brown chromatophores.

Dimensions.

Length, total,	45	mm.
End of body to mantle-margin,	11	„
End of body to eye,	9	„
Breadth of body,	11	„
Eye to edge of umbrella,	30	„
Diameter of largest sucker,	0·75	„
Length of arms,	30	„

This interesting little Cephalopod came into my hands in a condition of strong contraction, due to the action of strong spirit and of picric acid, in which I infer that it had been placed, partly from its strong yellow colour and partly from a statement in one of v. Willemoes-Suhm's letters to the effect that this reagent was commonly used on board for small Cephalopoda.[1] The body of the animal was much deformed owing to this contraction, and it was only after prolonged soaking in weak spirit that it was possible to make out the principal points in its organisation; indeed, it was long before I discovered the two lateral openings into the mantle cavity, supposing in consequence that this communicated with the exterior only by the siphon. There seems still to be an adhesion on one side between the mantle and the body, so that access into the branchial cavity on this side is impossible; it is so clear, however, on the other that it seems only reasonable to suppose that this closure is an abnormal condition.

As regards the affinities of the genus, it seems to be most nearly allied to *Cirroteuthis*, as shown by its arms bearing a single series of suckers and being united by a broad web. They resemble each other too in the great extent to which the mantle is united with the head, but in the one case the adhesion is lateral, in the other it is median.

As conspicuous points of difference may be noted, the absence of the cartilage (so far as can be ascertained by feeling through the body-wall), the absence of fins and of cirri along the arms.

In the delicacy and transparency of its tissues it also resembles *Bobitæna Eledonella* and *Japetella*, but this may be an adaptation to pelagic life rather than a point indicating morphological relationship.

[1] "Für Cephalopoden zarterer Art verwenden wir stets mit gutem Erfolg, ehe wir sie in Alkohol thun, eine verdünnte Lösung von Chrom- oder, bei kleineren, namentlich durchsichtigen Arten, Pikrinsäure," Challenger Briefe VI., *Zeitschr. f. wiss. Zool.*, Bd. xxvi. p. lxxx, 1876. I may take this opportunity of recommending others to avoid the use of this reagent for Cephalopoda.

Family III. Argonautidæ, Cantraine.

Argonauta, Linné.

Argonauta argo, Linné.

1758. *Argonauta argo*, Linn., Syst. Nat., ed. x. p. 708.
1817. „ *haustrum*, Dillwyn, Descr. Catal., p. 335 (=*forma aurita*).
1838. „ *argo*, d'Orb., Céph. acét.; Argonaute, pl. ii. figs. 1, 2.
1852. „ *Gruneri*, Dunker, Zeitschr. f. Malak., p. 48 (=*forma mutica*).
1861. „ „ Reeve, Conch. Icon., pl. iii. fig. 2*b* (=*forma mutica*).
1861. „ *argo*, Reeve, Conch. Icon., pl. iii. fig. 2*c*.
1861. „ *haustrum*, Reeve, Conch. Icon., pl. ii. (=*forma aurita*).

Habitat.—Cape of Good Hope, December 1873. One medium sized specimen.

Atlantic, Cape of Good Hope (d'Orbigny, Tryon); Madeira (Suhm, MS.); Mediterranean (d'Orbigny, Cantraine, Vérany, &c.); east coast of the United States (Lockwood, Verrill); Pacific and Gulf of California (Tryon).

The specimen brought home by the Challenger measures 90 mm. in length, and is of special interest because it shows the process of repair. On the right hand side a large crack has run across the shell from a point about 10 mm. from the inner cusp to about midway along the convex curve; at its commencement this expands into a notch 18 mm. across and 11 mm. deep, while farther back it leads into a hole in the form of an isosceles triangle whose sides are 25 mm. and whose base is 18 mm. It passes also quite across the carina of the shell, and about 15 mm. on to the left side. Besides this crack there are two irregularly oval holes, each about 10 mm. long on the left side, a small one on the right, and two on the carina.

Repair has proceeded to such an extent that the notch is almost filled up, and from a consideration of the lines in the calcareous matter deposited this seems to have taken place while from 3 to 5 mm. were being added to the rest of the margin. The large triangular hole has been quite filled, though the layer covering it is somewhat thinner than the remainder of the shell; and the smaller holes are partially or completely filled by an exceedingly delicate membrane, so thin as to be quite flexible, and bearing a strong superficial resemblance to goldbeaters' skin.

Assuming that the injuries were all inflicted at one time, this would indicate that the most important lesions were most rapidly repaired. Another matter deserving of special notice is that the material which has filled up the marginal notch is quite different from that which has been employed in repairing the holes. The former is perfectly smooth, shining, and porcellanous, and marked with striæ parallel to the margin, while the latter is dull, rough, and irregularly scratched, one or two lines describing elliptic curves; this latter substance, moreover, seems to rise up from the under surface of the shell, for

while it is evenly continuous with the inner surface it does not rise up quite so high as the outer, leaving the rough angles exposed. The two materials meet in a distinct line near the bottom of the notch.

This confirms what has been stated by previous observers, that the processes of repair are differently carried out in the marginal and central parts of the shell.

Family IV. PHILONEXIDÆ, d'Orbigny.

Tremoctopus, Delle Chiaje.

Philonexis, d'Orbigny.

Tremoctopus quoyanus (d'Orbigny), Steenstrup (Pl. XIII. fig. 7).

1835. *Octopus* (*Philonexis*) *Quoyanus*, d'Orb., Amér. mérid., p. 17, pl. ii. figs. 6–8.
1838. *Philonexis Quoyanus*, d'Orb., Céph. acét., p. 96; Poulpes, pl. xvi. figs. 6–8, pl. xxiii. fig. 5.
1861. *Tremoctopus Quoyanus*, Stp., Vid. Meddel. nat. Foren. Kjøbenhavn, Aar 1860, p. 332.

Habitat.—North Atlantic, April 28, 1876; lat. 17° 47′ N., long. 28° 28′ W. (at noon); from the tow-net at night; surface. Seventeen specimens (8 ♀, 9 ♂).

South Pacific, between the Sandwich Islands and Tahiti, September 15, 1875; lat. 12° 8′ S., long. 150° 13′ W. One specimen, ♂.

South Atlantic (d'Orb.); Atlantic (Stp.).

Of the seventeen specimens from the Atlantic above recorded, the three largest were in a separate bottle labelled "in absolute alcohol," while a fourth was mounted in a cell as a microscopic object, but, owing to the impossibility of identification in that condition, it was transferred to a tube of alcohol.

All the males had the hectocotylised arm (the third on the right side) still enclosed in its sac, which had the form of a large tumour extending as far as the margin of the mouth; and in one case there were six suckers upon its inner surface close to the margin of the mouth, belonging to the arm which was just issuing from its sac, an interesting fact as showing that the sac opens first at its oral margin (Pl. XIII. fig. 7).

The specimen from the Pacific Ocean was not very well preserved, the web between the arms having been almost entirely destroyed, so that error in its identification is by no means impossible.

The largest female specimen obtained was so much larger than those measured by d'Orbigny that it seems worth while to record its principal dimensions; it does not appear to be sexually mature, and Professor Steenstrup informs me that he has never seen any individual in that condition.

Dimensions.

Length, total,	70 mm.
End of body to mantle-margin,	12 „
End of body to eye,	18 „
Breadth of body,	16 „
Breadth of head (including the eyes),	16 „
Diameter of largest sucker,	0·75 „

	Right.	Left.
Length of first arm,	50 mm.	45 mm.
Length of second arm,	45 „	52·5 „
Length of third arm,	17·5 „	20 „
Length of fourth arm,	32·5 „	27·5 „

Tremoctopus atlanticus (d'Orbigny), Steenstrup.

1835. *Octopus* (*Philonexis*) *atlanticus*, d'Orb., Amér. mérid., p. 19, pl. ii. figs. 1–4.
1838. *Philonexis atlanticus*, d'Orb., Céph. acét., p. 98; Poulpes, pl. xvi. figs. 4, 5.

Habitat.—North Atlantic between Tenerife and St. Thomas, Danish West Indies; surface. Fourteen specimens (6 ♀, 8 ♂).
Tropical Atlantic (d'Orb.).

The male specimens from the North Atlantic present a very interesting series of graduated sizes, illustrating the gradual development of the hectocotylus. The smallest had a mantle of 2·5 mm. in length, the position of the third right arm was occupied by a small round process, of about 0·75 mm. in diameter; in another, where the mantle was about 3 mm. in length. the hectocotylus was 1·5 mm. in diameter, while a third, with a mantle 4·5 mm. long, had a hectocotylus 2·5 mm. in diameter.

Tremoctopus gracilis (?) (Eydoux et Souleyet), Tryon (Pl. XIII. figs. 8, 9).

1852. *Octopus gracilis*, E. et S., Voy. "Bonite," p. 13, pl. i. figs. 8, 9.
1879. *Tremoctopus gracilis*, Tryon, Man. Conch., vol. i. p. 131.

Habitat.—Western Pacific, between Papua and Japan; surface. One specimen, ♂.
North Pacific, lat. 8° N., long. 106° W. (E. and S.).

I cannot with satisfaction refer this specimen to any of the known species of *Tremoctopus*, but it appears to agree fairly with the form described by the naturalists of the "Bonite," although their diagnosis is by no means so complete as might have been wished. In the present case the most striking peculiarity is in the formation of the hectocotylus, and that perhaps they had no opportunity of observing.

The third right arm is as usual absent, but instead of its place being occupied by a round sac, there is seen beneath the skin a narrow white thread disposed in an elliptic

spiral of one and a half turns (Pl. XIII. fig. 8). The thread was removed from its sac and was then seen to present the form depicted in fig. 9. It is about 12 mm. in length, and there is a swelling near one end of it (fig. 9, *a*) which is evidently the rudiment of the "pyriform portion" or capsule figured by Steenstrup in *Tremoctopus quoyanus*, and by Vérany in several Mediterranean species;[1] while the more slender continuation of the arm is evidently the filament of other forms. One side of it bears two series of minute suckers, as far as the swelling above mentioned. There is nothing to indicate that the adult hectocotylus would differ materially from that of other species, but in the other young forms which I have seen, it has been developed in a small globular swelling, and not laid out flat under the skin.

As regards other specific characters, the dorsal arms are about twice the length of the mantle and a little longer than the second pair; the ventral arms are about as long as the mantle and nearly twice as long as the third pair. There is a pair of aquiferous pores on the top of the head, and another pair situated one on either side of the siphon; the eyes are large and spheroidal, but do not present the pedunculate appearance seen in Eydoux and Souleyet's figure.

Family V. Alloposidæ, Verrill.

Alloposus, Verrill.

Haliphron (*?*), Steenstrup.

Alloposus mollis, Verrill.

1861. *Haliphron atlanticus* (*?*), Stp., Vid. Meddel. nat. Foren. Kjøbenhavn, Aar 1860, p. 333.
1880. *Alloposus mollis*, Vll., Amer. Journ. Sci. and Arts, vol. xx. p. 394.
1881. „ „ Vll., Ceph. N. E. Amer., pp. 366, 420, pls. l., li. figs. 3, 4.
1884. „ „ Vll., Second Catal., p. 247.

Habitat.—North Atlantic. Two fragments of a dead specimen.

Off Newport, Rhode Island, 238 to 506 fathoms; off Chesapeake Bay, 300 fathoms; off Delaware Bay, 197 fathoms; off Martha's Vineyard, 310 to 715 fathoms; south of Nantucket Island, U.S.A., 1346, 1735 and 1731 fathoms (Verrill).

A bottle labelled "Part of a mutilated cuttle-fish picked up at sea. North Atlantic," came into my hands among the collection: it contained part of the interbrachial web near the mouth and a portion of an arm.

The web measures about 16 cm. in its greatest diameter, and contains portions of

[1] Hectocotyl., p. 208, pl. ii. fig. 8*a*; Céph. médit., pl. xli. I may here correct a mistake in Mr. Dallas' rendering of Steenstrup's paper (*Ann. and Mag. Nat. Hist.*, ser. 2, vol. xx., 1857); on p. 104, line 33, for "although this" read "and it." The mistake may have arisen through the English version having been taken from a German one and not directly from the Danish.

four arms, of which the longest is about 14 cm. long, and contains six suckers. The innermost of these, judging from the way in which the arms slope towards each other, must have been either that nearest the mouth or the second one; it is about 1 cm. in diameter, while the distal one on the fragment measures 1·5 cm. The suckers consist of hollow muscular bulbs like those of *Cirroteuthis*, embedded in the comparatively loose tissues of the arm, but the ridge marking off the true cavity from the suctorial disk is less marked, and the interior seems to have been lined by a kind of cuticle, which remains as a softened mass within it. The stellate form of the aperture, so distinctly marked in Verrill's figure of the hectocotylised arm (*op. cit.*, pl. li. fig. 4) is seen to some extent here, though the rays of the star are more numerous and much less prominent. The web itself is thick, tough, and very much wrinkled, and forms two or more circular folds around each sucker.

The portion of the arm is 12 cm. long and elliptical in section, the axes of the ellipse being 4·5 cm. and 7 cm. respectively. It seems to consist of a cylindrical core 3 cm. in diameter, composed of a gelatinous material containing numerous muscle-fibres embedded in it: around this is a quantity of connective tissue. Only on the inner aspect of the arm is any integument preserved; this is precisely similar in character to that surrounding the mouth, and contains four suckers, which are about 12 mm. in diameter and 3·5 cm. apart (measuring from centre to centre); they are arranged in a slightly wavy line.

The fragments above described agree so well in every particular with Professor Verrill's graphic description of his *Alloposus mollis*, that there can be no doubt they belong to that species.

When in Copenhagen the year before last, Professor Steenstrup showed me the type specimen of his *Haliphron atlanticus*, and I was at once struck by its remarkable resemblance to the hectocotylised arm of *Alloposus* as depicted by Verrill. The specimen is in fact a portion of an arm some 5 or 6 cm. in length, with two rows of very prominent beehive-shaped suckers, the apertures of which are markedly stellate in form.[1] Unfortunately the specimen has been somewhat macerated, having been found in the stomach of a shark, and no trace remains of the fringe of slender processes which forms such a conspicuous character in *Alloposus*.

Steenstrup's name was published nearly twenty years before Verrill's, and, in the event of the identity of the two genera being conclusively proved, must take precedence. The possibility must not be overlooked that the two forms may be two distinct species belonging to the same genus.

[1] The original description characterises the species by the resemblance of the lobate suckers to the half-opened flowers of the lily of the valley, *Convallaria majalis*, Stp., *op. cit.*, p. 332.

Family VI. Octopodidæ, d'Orbigny (*em.*).

Octopidæ, d'Orbigny.

The subdivision of the Octopoda into smaller groups presents considerable difficulties: Steenstrup and others following him have characterised two considerable groups, according as the suckers are in a single or in several series,[1] but the importance of this character seems to me overrated. In the first place, the character is one rather of degree than of kind, as may be readily seen from the facts that the proximal suckers in the arm of an *Octopus* are almost always arranged in a single series, and that the number of suckers so disposed is greater or less according as the arm is bent outwards or inwards. This circumstance and the arrangement of the suckers, not opposite in pairs but in a zigzag line, at once suggest that the two modes of disposition may pass one into the other (see also pp. 76, 78).

Furthermore, glancing at the results of this method of classification, it is seen that *Eledone* and *Octopus* are separated from each other, and that the former is united with *Cirroteuthis* and the latter with *Tremoctopus* and *Argonauta*. It is not necessary to recapitulate the points of likeness between the first two genera nor those in which they severally differ from the forms with which they are thus brought into contact. Indeed, I do not for the present feel disposed to place *Octopus* and *Eledone* in separate families at all, the only conspicuous internal difference between them being that in the latter the eggs are attached each by a separate stalk to the wall of the ovary.[2] If it were necessary to break up the Octopodidæ, I should propose rather to separate from them the soft semi-gelatinous forms, such as *Bolitæna* and *Japetella*, which in this peculiar constitution of their bodies resemble the Alloposidæ and Cirroteuthidæ (though this may indicate merely analogy not homology), but our knowledge of them is at present too fragmentary to render such a course advisable.

Octopus, Lamarck.

This genus continues much the same in general scope as when defined by Lamarck, the only considerable loss it has sustained being the removal of the genus *Eledone*.

There is perhaps no other group which presents so many difficulties to the systematist, for no two authorities seem agreed as to the characters which are to be relied upon for the purpose of defining species; it will therefore be advisable to say a few words regarding the principles which have been followed in the present Report.

The general form and proportions of the body are of some value, though not of much, for the whole consistency is soft, there is no firm internal skeleton to aid in giving a determinate outline, and any one who has watched a living *Octopus* and seen the mantle

[1] Overblik, p. 69; Fischer, Man. de Conch., p. 331.

[2] Grant, *Edin. New Phil. Journ.*, vol. ii. p. 317, 1827; and Brock, *Morphol. Jahrb.*, Bd. vi. pp. 283, 284, 1880.

alternately distending and contracting with the respiratory movements, will easily understand how variations in form may arise. Nevertheless, when a number of specimens of the same species are compared which have been subjected to pretty much the same treatment, a certain similarity is usually to be remarked among them.

The relative length of the arms, both with respect to each other and to the body, was regarded by d'Orbigny as a point of the greatest importance, and although it has again and again been shown that he greatly exaggerated this,[1] nevertheless he has been followed by many authorities, such as Gray and Tryon. The arms of an *Octopus* being almost wholly muscular, and entirely devoid of any hard or even cartilaginous parts whatsoever, are capable of a very considerable degree of contraction and extension, and as, when killed by being placed in fresh water or alcohol or poisonous solutions, they twist their arms about in the most lively manner, it follows that they may die with them in very varied states of contraction. There are, of course, cases in which the dimensions of one or more pairs of arms are so preponderant that no hypothesis of irregular contraction will account for the difference, which must then be regarded as a matter of systematic importance; such instances are to be seen in *Octopus macropus*, Risso, where the first pair, and in *Octopus aranea*, d'Orbigny, where the fourth pair of arms greatly exceed the others. When, however, d'Orbigny places his *Octopus fontanianus* in the division "Bras inférieurs les plus longs," because the length of the upper arms is 165 mm. and of the lower 166 mm., he carries out the principle to an extent which is almost too ridiculous to require criticism.

The degree to which the arms are united by a web or umbrella is a valuable character, though it must be borne in mind that here, as in the case of the arms, small variations must be regarded as probably due to different degrees of contraction.

The colour has commonly been regarded as of but little systematic value, owing to the manifold variations in this respect which these animals undergo owing to the play of the chromatophores. It seems, however, reasonable to suppose that in animals which have been killed and preserved in the same way, the chromatophores will be similarly affected, and thus the differences which are due to their action eliminated. Certainly in examining the Challenger material I have remarked that specimens which seemed on other grounds to be referable to the same species have generally agreed also in regard to colour. There are some cases (*e.g.*, *Octopus pictus*, Brock, and *Octopus lunulatus*, Quoy and Gaimard) in which the colour is disposed in definite bands or patches, and in these its distribution is quite diagnostic.

The nature of the surface of the body, namely, whether smooth or provided with warts or cirri, is also regarded by d'Orbigny with disfavour, on the ground that variations in this respect occur in correlation with the position and state of irritation or repose of the animal. The remarks just made regarding the colour apply to a large extent here

[1] See Verrill, Ceph. N. E. Amer., p. 381, and pp. 86, 93, 100 of the present Report.

also; the warts and cirri certainly vary according to the mode of preservation, but they are rarely so masked as not to be perceptible on careful examination. The matter is still open to question, however, and any one who can readily obtain numbers of fresh specimens would do a good work by killing and preserving them in different ways and reporting upon the variations thus produced in their surface markings.

A character which has been much used by some authors, Gray for instance, is the fact that a certain number of the proximal cups are often arranged in a single series. This, I feel convinced, is of very little importance; the statement that the suckers in the genus *Octopus* are in two series is not, strictly speaking, correct, they are placed in a zigzag so close that they often appear to form a succession of pairs, but when the arm is extended (bent away from the mouth) the proximal portion of the zigzag is stretched out and the suckers fall into a more or less nearly straight line, on the other hand, when the arm is flexed (towards the mouth) the zigzag closes up and the two series reappear. The presence or absence of certain large suckers on the lateral arms, used by d'Orbigny, and by Gray and Tryon following him, for specific diagnosis, has long since been shown by Steenstrup to be merely a sexual character.

To sum up, then, I have paid some attention to the form and proportions of the body, not much to variations in the lengths of the arms (unless these were considerable), some to the colour, and a good deal to the nature of the surface of the body.

Any peculiarities that presented themselves in the suckers have, of course been noted, and the same is the case with the hectocotylised arm whenever this was present.

Of this last structure I have observed what seem to be three fairly distinct types:—

1. That found in *Octopus vulgaris*, *Octopus marmoratus* (Pl. VI. figs. 2, 3), &c., where the modified extremity is minute in relation to the arm; it is conical, or rather pyramidal, and has a narrow groove on the inner side.

2. The form seen in *Octopus levis* (Pl. II. fig. 2), *Octopus januarii* (Pl. VII. fig. 2), &c., which resembles the last in form, but is decidedly more bulky and conspicuous. It shows a tendency to develop transverse ridges on the interior of the spoon-shaped termination, and reaches its extreme form in *Octopus obesus*, Verrill.[1]

3. The form which has only been found, so far as I am aware, in *Octopus punctatus*, Gabb. (see Pl. V. fig. 2). It is slender and very long in proportion to the arm, being nearly one-tenth of its total length in the Challenger specimen.

There is a temptation to break up the large genus *Octopus* into groups based upon characters derived from this organ, but I have been unable at present to ascertain that they are correlated with other distinctions between the different forms, and it may prove impossible to keep these three types separate when the structure of the hectocotylised arm shall become known in a greater number of species than is at present the case.

[1] See Ceph. N. E. Amer., pl. xxxvi. fig. 4.

Octopus occidentalis, Steenstrup, MS.

... *Octopus occidentalis*, Steenstrup, MS. in Mus. Havn.
1853. „ *vulgaris*, var. *americanus*, d'Orb., Moll. Cuba, p. 14, tab. i.

Habitat.—Ascension, April 1876. One specimen ♀.
Cuba (d'Orb).

The Body is short and oblong, somewhat expanded behind, and deeply grooved in the middle line. The *mantle-opening* terminates midway between the eyes and the *siphon*, which is conical, pointed and of quite the average length, extending fully half-way to the umbrella-margin.

The Head is very short and as broad as the body, the *eyes* being very prominent and the eyelids much contracted.

The Arms are subequal, about six times the length of the body. The *umbrella* extends nearly one-third up the arms, to the least extent apparently between the dorsal pair, though this may be owing to the state of contraction. The *suckers* are of moderate size, but present no characteristic peculiarities. The *circumoral lip* is invisible, owing to its retraction, the suckers extending quite to the centre.

The Surface is rough, slightly so on the body, but with minute irregular papillæ scattered over the head and the outer surfaces of the arms. The internal surface of the umbrella bears very numerous papillæ, which are aggregated into clusters, between which the skin is smooth; they extend over the inner surface of the arms between the suckers, and the wall of these bears minute warts on its outer surface. There are traces of one or two irregular cirri over each eye, but none can be found on the back.

The Colour of the upper surface of the body, head, and outside of the arms is dark brown, almost black, the ventral surface of the body being amber-brown; the inner surface of the umbrella is pale yellow, the groups of papillæ being still of a pinkish hue, though not so deeply coloured as in d'Orbigny's figure (*loc. cit.*), which was perhaps drawn from life.

Dimensions.

Length, total,	300 mm.
End of body to mantle margin,	35 „
End of body to eye,	55 „
Breadth of body,	50 „
Breadth of head,	40 „
Eye to edge of umbrella,	about 50 „
Diameter of largest sucker,	7 „

	Right.	Left.
Length of first arm,	235 mm.	120[1] mm.
Length of second arm,	235 „	240 „
Length of third arm,	230 „	230 „
Length of fourth arm,	220 „	230 „

[1] Mutilated. The lengths of the arms are measured from the margin of the mouth.

There can be no doubt that this specimen is to be referred to the same species as that figured by d'Orbigny (*tab. cit.*), but there is much more difficulty in deciding by what name it should be called. When the plates accompanying the "Cuba Memoir" were drawn it is evident that d'Orbigny regarded it as varietally distinct from *Octopus vulgaris*, Lmk., for the plate is lettered "*Octopus vulgaris*, var. *americanus*," and since this figure is really the type of the species, it would have been desirable to elevate d'Orbigny's designation into a specific name, and to quote him as the authority for it. The first objection to this is that d'Orbigny seems to have abandoned his idea of establishing this as a formal variety, for in his text he makes no further allusion to its characteristic peculiarities than "Nous avons cru remarquer que les individus américains, tout en présentant les proportions et tous les autres caractères de ceux de nos côtes, sont néanmoins plus tachetés de rouge en dedans de l'ombrelle" (*loc. cit.*, p. 415). The second objection is more serious, and consists in the fact that the name *americanus* has been already applied to an *Octopus* by de Blainville,[1] following de Montfort,[2] who applied the name "Poulpe americain" to a figure published by Barker.[3] The drawing was so insufficient that the name has never come into use, and it would be quite impossible to demonstrate its identity with the present form. Under these circumstances I have not felt justified in adopting d'Orbigny's name, but have thought it better to use Steenstrup's MS. designation.

The individual examined presents some curious irregularities in the disposition of the suckers. The left dorsal arm has the six proximal suckers disposed in the usual manner (the first four being in one series), and after them a gap, large enough to have contained two suckers, which have been, as it were, dislocated on to the umbrella just at the dorsal margin of the arm. The right dorsal arm has a supernumerary sucker just beyond the eleventh; and the third arm on the right side has the nine proximal suckers arranged normally, but beyond them are two transverse rows, each containing three suckers. Such deviations from the usual rule suggest the question whether *Tritaxeopus cornutus*, Owen,[4] may not be merely a case in which a similar malformation is more completely carried out.

Octopus tuberculatus, Blainville.

1826.	*Octopus tuberculatus*,	Blv., Dict. d. Sci. Nat., t. xliii. p. 187.	
1838.	„	„	d'Orb., Céph. acét., p. 38; Poulpes, pls. xxi., xxiii.
1869.	„	„	Targ., Ceph. Mus. Firenze, p. 18.

Habitat.—Station 122B, off Barra Grande, September 10, 1873; lat. 9° 9′ S., long. 34° 53′ W.; 32 fathoms; red mud. One young specimen.

[1] Dict. d. Sci. Nat., p. 189, 1826.
[2] Buffon de Sonnini, Moll., t. iii. p. 30, pl. xxix., 1802.
[3] *Phil. Trans.*, vol. l. part 2, p. 777, pl. xxix. figs. 1–4, 1758.
[4] *Trans. Zool. Soc. Lond.*, vol. xi. p. 131.

Atlantic, coasts of France, of the Antilles, and of Africa, Mediterranean (d'Orbigny); Gorée, Senegal (W. E. H.), Messina (Targioni-Tozzetti).

A small specimen obtained at the above locality seems to be properly referable to this species, although certainty is impossible in the case of so immature a creature.

I do not propose here to discuss the question how far this species is removed from *Octopus vulgaris*, but it seems to me that they are rather further apart than would be expressed by ranking them as varieties.

Whether *Octopus ruber*, Rafinesque,[1] be identical with this is still more uncertain, the definition of that author being as unsatisfactory as usual. Moreover, his species has been regarded as identical with *Octopus macropus*, Risso, and having regard merely to the colour, which is the character emphasised by Rafinesque's name, this would seem likely; it is to be noted, however, that the arms of *Octopus macropus* very greatly exceed the length mentioned by Rafinesque ("environ le double du corps").

Octopus verrucosus, Hoyle (Pl. IV.).

1885. *Octopus verrucosus*, Hoyle, Diagnoses I., p. 222.
1885. „ „ Hoyle, Prelim. Rep. I., p. 96.

Habitat.—Inaccessible Island, Tristan da Cunha, October 16, 1873. Two specimens, ♂.

The Body is rounded, but so distorted by compression that no further details can be given. The *mantle-opening* extends fully halfway round the body, terminating a little below and behind the eye. The *siphon* is long, evenly conical and pointed, and extends nearly halfway to the umbrella-margin.

The Head is short, not so broad as the body, and with *eyes* but slightly prominent.

The Arms are unequal in length, the second pair being considerably the longest, and almost six times as long as the body; they are comparatively stout, and taper gradually. The *umbrella* extends about one-fifth up the longest arms. The *suckers* are fairly close, deeply cupped and marked with radial grooves (fig. 2), between which are numerous very minute papillæ (fig. 3). About four suckers on each lateral arm, opposite the umbrella-margin, are larger than the others;[2] beyond these they gradually diminish. The extremity of the *hectocotylised arm* resembles that of *Octopus vulgaris*, but is very minute (about 2 mm. long in the larger specimen); it is acutely pointed, and the median groove has three transverse ridges.

The Surface of the back, dorsal surface of the head, and umbrella is covered with irregular closely-set warts, which attain a maximum diameter of several millimetres in

[1] Précis découv. somiol., p. 28.

[2] This is a sexual character, as is clearly shown by the analogy of numerous other species.

the nuchal region, a few larger ones extend down the back on either side of the middle line; the warts extend on to the ventral surface of the body, where they become much smaller, more even, and average less than 1 mm. in diameter; they do not cover the inner surface of the umbrella between the two dorsal arms. Above each eye there seems to have been a short cirrus, but these have been rather damaged.

The Colour is a dull purplish grey, very dark above, much lighter below.

The Jaws are figured on Pl. IV. figs. 4, 5.

Dimensions.[1]

Length, total,	470	mm.
End of body to mantle margin,	55	„
End of body to eye,	80	„
Breadth of body,	55	„
Breadth of head,	40	„
Eye to edge of umbrella,	60	„
Length of extremity of hectocotylised arm,	2·5	„
Breadth of extremity of hectocotylised arm,	1·5	„
Diameter of largest sucker on lateral arm,	18	„
Diameter of largest sucker on ventral arm,	8	„

	Right.		Left.	
Length of first arm,	270[2]	mm.	320	mm.
Length of second arm,	350	„	380	„
Length of third arm,	320	„	320[2]	„
Length of fourth arm,	260[2]	„	320	„

This species differs very markedly from *Octopus granulatus*, Lamk., in the size and form of the tubercles covering the body and head and in the rows of larger ones down the back, as also from *Octopus fontanianus* in which the granulation is much finer. From *Octopus tetricus*, Gould, it differs in the smaller size of the umbrella.

Octopus granulatus, Lamarck.

1799. *Octopus granulatus*, Lamarck, Mém. Soc. Hist. Nat. Paris, t. i. p. 20.
1838. „ *rugosus*, d'Orb., Céph. acét., p. 45; Poulpes, pls. vi., xxiii. fig. 2.
1869. „ *incertus*, Tozz., Cef. Mus. Firenze, p. 22, tav. vi. figs. 9, 11.

Habitat.—St. Vincent, Cape Verde Islands, April 25, 1876; 15 to 20 fathoms. One specimen, .

Simon's Bay, Cape of Good Hope; 10 to 20 fathoms. One young specimen.

Atlantic Ocean, shores of the Antilles and Senegal; Pacific Ocean, Manila, Mauritius, Batavia (d'Orbigny); Ceylon (W. E. H.).

Férussac and d'Orbigny identify this species with *Sepia rugosa*, Bosc,[3] and adopt his name in consequence, but his description is so indefinite that it is hardly sufficient

[1] The arms were so bent and contracted that their lengths can only be regarded as approximate.
[2] Mutilated.
[3] *Actes Soc. Hist. Nat. Paris*, 1792, tab. 5, figs. 1, 2.

to form the criterion of a good species, and hence Lamarck's name is here preferred. A long synonymy is given by those authors, which I have not thought it necessary to repeat.

There seems to be no point of importance by which Targioni-Tozzetti's *Octopus incertus* can be distinguished from the present form.

Like most other rough-skinned species of *Octopus*, this belongs to Professor Steenstrup's group *Schizoctopus*, characterised by having the umbrella between the dorsal arms very short and the cutaneous sculpture continued over its inner surface.

Octopus boscii (Lesueur), var. *pallida* (Pl. I. ; Pl. III. fig. 2)..

1885. *Octopus Boscii* (Lesueur), var. *pallida*, nov., Hoyle, Diagnoses I., p. 223.
1885. „ „ „ „ Hoyle, Prelim. Rep. I., p. 97.

Habitat.—Station 162, off East Moncœur Island, Bass Strait, April 2, 1874 ; lat. 39° 10′ 30″ S., long. 146° 37′ E.; 38 fathoms ; sand and shells. One specimen, ♂ .

Station 163A, off Twofold Bay, Australia, April 4, 1874 ; lat. 36° 59′ S., long. 150° 20′ E.; 150 fathoms ; green mud. Two specimens, 1 ♀, 1 *juv.*

The Body is evenly rounded, with a slight depression in the median ventral line. The *mantle-opening* extends less than halfway round the body, terminating immediately below the eye, and further from it than from the base of the *siphon*, which is long and pointed, has rather a small opening, and extends two-thirds the distance to the umbrella-margin.

The Head is short and not so broad as the body ; the *eyes* are only slightly prominent.

The Arms are subequal, nearly four times the length of the body, and taper evenly to fine points. The *umbrella* extends one-third up the arms, being a little wider laterally than dorsally. The *suckers* are closely set, deeply cupped, and marked with regular radial grooves ; their biserial arrangement commences immediately after the first. The extremity of the *hectocotylised arm* is large and of the usual form except that its interior is furnished with papillæ instead of transverse grooves and ridges. The *circumoral lip* is low and narrow.

The Surface is covered with warts, which are largest and most numerous on the dorsal surface of the body, head, and umbrella, and dorsal aspect of the arms, where they have a quadrifid or quinquefid form, usually with a small wart in the centre, each forming a figure like a star or rosette (Pl. I. fig. 2). Towards the ventral surface and on the sides of the arms the warts are simple, and much smaller. On the back are about ten long cirri, which are rough with small warts, and above each eye is a very large arborescent cirrus with six or seven smaller ones beside it (Pl. I. fig. 3).

The Colour is a very pale purplish grey, shading off to a creamy white on the ventral surface.

The Jaws are shown on Pl. I. figs. 4, 5.

Dimensions.[1]

Length, total,	325	mm.
End of body to mantle-margin,	65	„
End of body to eye,	70	„
Breadth of body,	70	„
Breadth of head,	50	„
Mouth to edge of umbrella between lateral arms,	65	„
Length of extremity of hectocotylised arm,[2]	8	„
Breadth of extremity of hectocotylised arm,[2]	2·5	„
Diameter of largest sucker,	7	„

	Right.	Left.
Length of first arm,	170 mm.[3]	200 mm.
Length of second arm,	215 „	215 „
Length of third arm,	225 „	220 „
Length of fourth arm,	220 „	220 „

The original *Octopus boscii* was discovered on the western coast of Australia by Péron and Lesueur, and received from the former the manuscript name *Sepia rugosa*, Bosc; Lesueur, however, was of opinion that it was not the same as the species figured by Bosc,[4] and therefore gave it the name of that naturalist, but without publishing any diagnosis.[5]

Férussac and d'Orbigny give a brief description,[6] but do not say upon what it is based, and in the British Museum collection there is a specimen named *Octopus boscii* by Gray,[7] though no trace can be found of what led him to this identification. Under these circumstances it appeared better to accept Gray's opinion and to give a new definition of the old species rather than erect the Challenger specimens into a new one; the more so as Gray's *Octopus* does not disagree in any particular with d'Orbigny's description.

There is, however, a marked difference between it and the Challenger specimens in colour (too great, I think, to be accounted for merely by the disposition of the chromatophores), and the surface ornamentation is better marked in the latter, so I have separated them as a distinct variety.

It seems not impossible that *Octopus tetricus*, Gould, should be referred to this species; the description of the surface ornamentation is very similar, and it comes from

[1] Taken from the largest specimen (♀).
[2] Taken from a smaller specimen, whose total length is 160 mm.
[3] Mutilated.
[4] *Actes Soc. Hist. Nat. Paris*, tab. v. figs. 1, 2.
[5] *Journ. Acad. Nat. Sci. Philad.*, vol. ii. p. 101.
[6] Céph. acét., p. 68.
[7] B. M. C., p. 12.

the same region.[1] One arm bears a supernumerary sucker in the largest specimen (Pl. III. fig. 2).

Octopus tonganus, Hoyle (Pl. VIII. figs. 1, 2).

1885. *Octopus tonganus*, Hoyle, Diagnoses I., p. 225.
1885. „ „ Hoyle, Prelim. Rep. I., p. 100.

Habitat.—The Reefs, Tongatabu. Three mutilated specimens, one ♂, two ♀.

The Body is rounded, depressed, and broader than long, with a marked but shallow median groove on the ventral surface. The *mantle-opening* extends about one-third round the circumference of the body, terminating nearer to the funnel than to the eye. The *siphon* is short and conical, and extends rather more than halfway to the umbrella-margin.

The Head is small and the *eyes* prominent.

The Arms are unequal, the order being 3, 2, 4, 1; on an average they are nearly ten times as long as the body, and taper gradually to very fine points. The *umbrella* is very small, and slightly narrower dorsally than laterally. The *suckers* are for the most part small and closely packed; the first four are arranged in a single row; eight small suckers surround the mouth, but there is no distinct lip. In the male there are four large ones on each lateral arm opposite the margin of the umbrella, beyond which they gradually diminish. The extremity of the *hectocotylised arm* is very minute (fig. 2).

The Surface is in general smooth; the back bears a few small papillæ, but owing to the compression of the specimens it is impossible to make out their exact number. There are three minute cirri over each eye.

The Colour is on the whole grey, paler below; this is due to dark specks sprinkled more or less closely over a cream-coloured ground. One specimen has a purplish patch at either side of the mantle-opening.

Dimensions.[2]

Length, total,	285	mm.
End of body to mantle-margin,	30	„
End of body to eye,	32	„
Length of extremity of hectocotylised arm,	2	„
Breadth of extremity of hectocotylised arm,	0·75	„
Diameter of largest sucker on lateral arm,	5	„
Diameter of largest sucker on dorsal arm,	3	„

	Right.	Left.
Length of first arm,	150 mm.	153 mm.
Length of second arm,	240 „	203 „
Length of third arm,	180 „	235 „
Length of fourth arm,	210 „	213 „

[1] Moll., Wilkes Exped., 474.

[2] Taken from the male specimen.

The three specimens upon which this species is founded were much damaged owing to the pressure to which they had been subjected in packing; it was, however, possible by careful comparison of all three to make out characters distinguishing them from all hitherto known species.

Octopus vitiensis, Hoyle (Pl. VII. figs. 6–8).

1885. *Octopus vitiensis*, Hoyle, Diagnoses I., p. 226.
1885. „ „ Hoyle, Prelim. Rep. I., p. 100.

Habitat.—The Reefs, Kandavu, Fiji. One small specimen, ♀.

The Body is nearly oblong, but becomes somewhat narrower posteriorly. The *mantle-opening* extends nearly one-third round the body, and terminates some distance below and behind the eye. The *siphon* is long and acutely pointed, and extends about halfway to the umbrella-margin.

The Head is broader than the body, with large laterally prominent *eyes*.

The Arms are subequal, the two lateral pairs being a little longer than the others; on an average they are nearly three times as long as the body, and taper rather rapidly about the middle of their length and then more gradually to fine points. The *umbrella* extends nearly one-third up the arms, least along the dorsal pair. The *suckers* are sunken, comparatively large, with a dark margin and very well-marked radial grooves (Pl. VII. fig. 8). The first two in each arm are in a single series, owing to compression of the arms laterally (fig. 7); there are no enlarged suckers on the lateral arms. The only specimen being a female, no *hectocotylus* is developed.

The Surface of the dorsum of the body bears minute warts scattered here and there; over each eye there is a rather large branched cirrus, with a few small ones scattered round it. The internal surface of the arms is covered with minute hemispherical warts, so as to resemble shagreen (fig. 8).

The Colour is very dark grey, almost black on the dorsal surface and outer surface of the arms; paler grey below and on the inner surfaces of the arms. The dark warty character of the integument is not continued over the inner surface of the membrane uniting the two dorsal arms.

Dimensions.

Length, total,	60 mm.
End of body to mantle-margin,	15 „

	Right.	Left.
Length of first arm,	40 mm.	40 mm.
Length of second arm,	45 „	43 „
Length of third arm,	40 „	43 „
Length of fourth arm,	25[1] „	40 „

[1] Mutilated.

This small and possibly immature form differs from *Octopus tuberculatus*, which it somewhat resembles in the comparative shortness of its arms, in the fewness of its cirri, and more particularly in the shagreen-like internal surface of its arms, which last is its most distinctive peculiarity.

Octopus marmoratus, Hoyle (Pl. VI.).

1885. *Octopus marmoratus*, Hoyle, Diagnoses I., p. 227.
1885. „ „ Hoyle, Prelim. Rep. I., p. 102.

Habitat.—On the Reefs, Honolulu, Sandwich Islands. Three specimens, one ♂, two ♀. Sandwich Islands (Copenhagen Museum).

The Body is round, not depressed, and a little longer than wide. The *mantle-opening* extends somewhat less than halfway round the body, terminating nearer to the siphon than to the eye, and considerably behind the latter. The *siphon* is small and acutely conical, and extends about one-third the distance to the umbrella-margin.

The Head is narrow, and the *eyes* are prominent, where they have not suffered from compression.

The Arms are subequal, eight times as long as the body; they are very long and slender, the last character being more marked in the females than in the male; they taper more rapidly at first than near the extremities, which are much attenuated. The *umbrella* is very wide, especially in the male, where it extends almost one-third up the arms; in the females its extent is only one-sixth. The *suckers* are rather large, and closely set; in the male a few suckers opposite the umbrella-margin are slightly, but not markedly, larger than the others. The extremity of the *hectocotylised arm* is small, and has about ten small transverse ridges (figs. 2, 3).

The Surface appears to have been smooth, except for a few short ridges placed longitudinally on the back and sides; but the skin is shrivelled by the action of the spirit, so that it is difficult to be certain. A conical cirrus is situated above and slightly behind each eye; but in some cases this has been destroyed.

The Colour is a stone-grey, with dark pigment disposed in veins like those of marble[1] on the dorsal surface of the body, head, and umbrella (fig. 1); the male is much darker, so that the marbling is almost concealed. Traces of an oval spot are seen in front of and below the eye on both sides of one female specimen and on one side of the other; but this spot is concealed by the dark colouring in the male even if it exist.

[1] Hence the specific name.

Dimensions.	♀	♂
Length, total,	630 mm.	580 mm.
End of body to mantle-margin,	70 „	80 „
End of body to eye,	95 „	105 „
Breadth of body,	70 „	70 „
Breadth of head,	43 „	50 „
Eye to edge of umbrella (dorsally),	75 „	75 „
Eye to edge of umbrella (laterally),	100 „	105 „
Length of extremity of hectocotylised arm,	...	2 „
Breadth of extremity of hectocotylised arm,	...	1 „
Diameter of largest sucker on lateral arm,	7 „	14 „
Diameter of largest sucker on ventral arm,	...	10 „

	♀		♂	
	Right.	Left.	Right.	Left.
Length of first arm,[1]	530 mm.	490 mm.	460 mm.	315[2] mm.
Length of second arm,	560 „	400 „	400 „	500 „
Length of third arm,	470 „	540 „	315 „	475 „
Length of fourth arm,	560 „	510 „	400 „	470 „

This species presents in some respects a resemblance to *Octopus bimaculatus*,[3] Verrill, namely, in the general form and proportions, in the enlargement of one or more suckers on the lateral arms and in the small size of the hectocotylus of the male, as also in the presence of the dark spot on either side in front of the eye. Each, too, has a supra-ocular cirrus, but the conspicuously warted upper surface of Verrill's form and the equally marked smoothness of the Challenger specimens, as well as the seemingly constant difference of coloration necessitate their separation.

Octopus bimaculatus is from California, so that so far as regards habitat there would be no *à priori* ground for separating the two forms.

The new species agrees with unnamed specimens, from the same locality, in the Copenhagen Museum, in which the spots upon the side of the membrane are even more clearly marked, while the other characters remain the same.

It approaches *Octopus hawaiensis*, E. and S.,[4] in general form, but differs in the presence of cirri over the eyes.

Octopus areolatus, de Haan, MS. (Pl. III. figs. 6, 7).

1835. *Octopus areolatus*, de Haan, MS. letter (*fide* d'Orbigny).
1838. „ „ d'Orbigny, Céph. acét., p. 65.
1838. „ *sinensis* (*?*), d'Orbigny, Céph. acét., p. 68; Poulpes, pl. ix.
1849. „ *ocellatus*, Gray, B. M. C., p. 15.
1886. „ „ Appellöf, Japanska Ceph., p. 8, pl. i. figs. 1–3.

Habitat.—Station 192, off the Ki Islands, south of Papua, September 26, 1874; lat. 5° 49′ 15″ S., long. 132° 14′ 15″ E.; 140 fathoms; blue mud. One specimen, ♀.

Japan (de Haan, Appellöf); Hong Kong (Copenhagen Museum).

[1] The lengths of the arms are measured from the eye.
[2] Mutilated.
[3] *Bull. Mus. Comp. Zoöl.*, vol. xi. p. 121, 1883.
[4] Voy. "Bonite," p. 9, pl. i. figs. 1–5.

The Body is oblong, about as deep as wide. The *mantle-opening* extends nearly two-thirds round the body, terminating immediately behind the eye; the *siphon* is short, conical, and reaches one-fourth the distance up to the umbrella margin.

The Head is small and short, and the *eyes* are not prominent.

The Arms are subequal and about twice as long as the body, tapering evenly to thin points. The *umbrella* is wide, reaching somewhat less than half up the arms; it is continued along each side of them as a narrow fillet, which expands on the ventral aspect into a more or less wide membrane (Pl. III. fig. 6). The *suckers* are small, round, and prominent, the marginal portion being separated by a constriction from the somewhat conical base; they are not closely set. The specimen being a female, the *hectocotylus* is not developed.

The Surface is covered with shagreen-like pimples on the dorsal aspect of the body, head, and umbrella, which are here and there closely set so as to form short longitudinal ridges; above and slightly behind each eye is a low rough wart. The pimpled surface of the umbrella is continued on to its inner surface between the two dorsal arms.

The Colour is a dull purple, paler below; in front of each eye is a peculiar spot consisting of a dark centre separated by a pale ring from a dark external area; on the outer surface of each of the four ventral arms are two rows of dark elongated spots (Pl. III. fig. 7).

Dimensions.

Length, total,	103 mm.
End of body to mantle-margin,	30 „
End of body to eye,	33 „
Breadth of body,	25 „
Breadth of head,	19 „
Eye to edge of umbrella (dorsally),	18 „
Eye to edge of umbrella (laterally),	25 „
Diameter of largest sucker,	2 „
Diameter of the ocellus,	4 „

	Right.	Left.
Length of first arm,[1]	63 mm.	65 mm.
Length of second arm,	70 „	70 „
Length of third arm,	70 „	70 „
Length of fourth arm,	70 „	40[2] „

I have referred this to de Haan's species on the authority of the two specimens in the Copenhagen Museum, which Steenstrup informs me that he identified with some (presumably the types) labelled *Octopus areolatus*, de Haan, in the Leyden Museum.

It agrees with those in the tubercles on the back, the spot in front of each eye (which, however, is smaller in this specimen), and a dark band on the dorsal and second arms; smaller mottlings on the back and sides seen in the others are not so distinct in the

[1] Measured from the eye.

[2] Mutilated.

Challenger specimen owing to the deeper pigmentation of those parts. One of the Copenhagen specimens has two tubercles over each eye, the other none; and in both of them the longitudinal markings seen on the ventral arms are wanting.

Octopus australis, Hoyle (Pl. III. figs. 4, 5).

1885. *Octopus australis*, Hoyle, Diagnoses I., p. 224.
1885. „ „ Hoyle, Prelim. Rep. I., p. 98.

Habitat.—Port Jackson, Australia; 6 to 15 fathoms. Two specimens, one ♀, one immature.

The Body is rounded, and wider behind than in front; depressed, and with a well-marked ventral median groove. A sharp narrow ridge extends along either side of the body to the posterior extremity. The *mantle-opening* extends nearly half round the body. The *siphon* is of medium size; at first the lateral margins are parallel and then taper rapidly to a blunt point; it extends less than halfway to the umbrella margin.

The Head is narrower than the body, and the *eyes* somewhat prominent, dorsally rather than laterally.

The Arms are unequal, the lateral being slightly the largest, and about three times as long as the body; they are slender and tapering. The *umbrella* is longer than the length of the body; larger ventrally than dorsally, and larger laterally than ventrally. The *suckers* are prominent and closely set; they are altogether larger on the lateral arms, and extend in a double row to the centre; the radial grooves are deep, and extend quite to the margins. The specimens being females, no *hectocotylus* is present.

The Surface of the back of the body, head, and dorsal aspects of the umbrella and arms is covered with thick-set hemispherical pimples, which are also found on the inner side of the membrane between the two dorsal arms, and on the inner surfaces of the arms between the suckers. They are smaller and more sparse on the ventral surface of the body. A large rough cirrus and a few pimples larger than the others are found over each eye. A raised ridge passes backwards from the base of the siphon along the ventro-lateral margin of the body, meeting its fellow of the opposite side at the posterior extremity (Pl. III. fig. 5).

The Colour is deep purplish on the back, mottled on the sides, and cream below.

Dimensions.

Length, total,	87 mm.
End of body to mantle-margin,	20 „
End of body to eye,	22 „
Breadth of body,	19 „
Breadth of head,	14 „
Eye to edge of umbrella (dorsally),	16 „
Eye to edge of umbrella (laterally),	23 „
Diameter of largest sucker,	2·5 „

	Right.	Left.
Length of first arm,	55 mm.	60 mm.
Length of second arm,	60 „	63 „
Length of third arm,	65 „	65 „
Length of fourth arm,	40 „	50 „

It is doubtful what value is to be attached to the raised ridge mentioned above; it is to be seen in other species under certain conditions, possibly due either to different modes of preservation or to varying states of contraction; nevertheless, in the majority of forms it is never observed, and I am therefore inclined to attribute to it a certain systematic importance, the more especially as it occurs in both the specimens before me. *Octopus membranaceus*, Q. and G., seems to present the same condition carried out more fully.

The present species is decidedly paler and more ruddy in colour than *Octopus granulatus*, and the granulations are not so large nor so closely set as in that form. The mottling on the sides, too, is very marked.

Octopus tehuelchus, d'Orbigny.

1835. *Octopus tehuelchus*, d'Orb., Amér. mérid., p. 27, pl. i. figs. 6, 7.
1838. „ „ d'Orb., Céph. acét., p. 55; Poulpes, pl. xvii. fig. 6.
1870. „ *megalocyathus*, Phil. (?), Cunningham, Trans. Linn. Soc. Lond., vol. xxvii. p. 474.

Habitat.—St. Thomas, Danish West Indies; 8 fathoms.

East coast of Patagonia; lat. 40° S. (d'Orbigny); Strait of Magellan and Punta Arenas (Cunningham); Nicaragua (Copenhagen Museum).

I refer to this species, not without some hesitation, a small *Octopus* of about 5 cm. in total length, from the West Indies. The body is proportionally a little more elongated than in d'Orbigny's figure, but a specimen in the British Museum, brought by Cunningham from Sandy Point, resembles closely that obtained by the Challenger, which is also much like an unnamed form in the Copenhagen Museum from San Jan de Nicaragua, except that the arms of the latter are somewhat larger.

Cunningham's specimen in the British Museum is almost certainly the one alluded to in the Zoology of the Voyage of the "Nassau" (*loc. cit.*), where he speaks of obtaining it at the eastern end of the Strait of Magellan, and of numbers of mutilated specimens being thrown up on the beach at Punta Arenas. I have not been able to find the original description of "*Octopus megalocyathus*, Phil.," the only species bearing that name known to me being the one described by Gould in the Mollusca of the Wilkes Expedition, p. 471.

Octopus duplex, Hoyle (Pl. VII. fig. 5).

1885. *Octopus duplex*, Hoyle, Diagnoses I., p. 226.
1885. „ „ Hoyle, Prelim. Rep. I., p. 101.

Habitat.—Station 163A, off Twofold Bay,[1] South-East Australia, April 4, 1874; lat. 36° 59′ S., long. 150° 20′ E.; 150 fathoms; green mud. Two specimens, one ♀, one ♂, immature.

The Body is short and evenly rounded, with the merest trace of a median ventral groove. The *mantle-opening* extends about half round the circumference, and terminates halfway between the siphon and the eye. The *siphon* is relatively long, conical, and pointed, and extends about halfway to the umbrella-margin.

The Head is small, and the *eyes* rather prominent

The Arms seem to have been unequal, the lateral the longest, but so many have been mutilated that it is difficult to be certain; they are about four times the length of the body. The *umbrella* extends about one-third up the arms, farthest between the lateral pairs. The *suckers* are large, close, and prominent, with a narrow margin marked off from the basal portion; the radial grooves extend to the margin and form notches in it. The *hectocotylus* is not present, the specimen being a female; the third right arm has been mutilated, but the stump shows no groove running up the outer ventral margin.

The Surface is smooth; an interrupted ridge starting from the base of the siphon passes backwards along the ventro-lateral margin of the body, probably due to contraction. There are three small papillæ above each eye.

The Colour is a pale bluish grey above, shading into a creamy tint below.

Dimensions.

Length, total,	80 mm.
End of body to mantle margin,	15 „
End of body to eye,	17 „
Breadth of body,	18 „
Breadth of head,	13 „
Eye to edge of umbrella,	13 „
Diameter of largest sucker,	2 „

	Right.	Left.
Length of first arm,	55 mm.	53 mm.
Length of second arm,	? „	53 „
Length of third arm,	? „	? „
Length of fourth arm,	43 „	50 „

All my efforts to identify this with any previously known species have failed, which is the more remarkable, inasmuch as it presents no very special distinctive characters.

[1] Hence the specific name.

It will probably prove to be identical with some of the forms from the same region which have hitherto been insufficiently described.

Octopus piscatorum, Verrill.

1879. *Octopus piscatorum*, Vll., Amer. Journ. Sci. and Arts, vol. xviii. p. 470.
1881. „ „ Vll., Ceph. N. E. Amer., p. 377, pl. xxxvi. figs. 1, 2.
1884. „ „ Vll., Second Catal., p. 248.
1885. „ „ Vll., Third Catal., pl. xlii. fig. 5.

Habitat.—Station 8, Færöe Channel, H.M.S. "Knight Errant" Expedition, August 17, 1880; lat. 60° 3′ N., long. 5° 51′ W.; 540 fathoms; ooze. One specimen, ♂.

Station 9, Færöe Channel, H.M.S. "Triton" Expedition, August 23, 1882; lat. 60° 5′ N., long. 6° 21′ W.; 608 fathoms; mud. Two specimens, one ♂, one ♀.

Off La Havre Bank, Nova Scotia, 120 fathoms; near the Grand Bank, 200 fathoms; south of Nantucket Island,1362 fathoms (Verrill).

It is not a little interesting that this species should have been found on the north-west coast of Europe, whither so many species which have been described from the coast of America seem to extend; another instance will be found in the case of Verrill's *Octopus bairdii*, which has been found by Sars off the Norwegian coast, and by the British expeditions in the Færöe Channel (see next species).

The hectocotylised arm, which Verrill's specimens being females did not show, closely resembles that of *Octopus arcticus*, Prosch, and agrees very well with the figure given by Steenstrup,[1] except that it is rather more pointed at the tip.

Octopus arcticus, Prosch.

1834. *Sepia gröenlandica* (?), Dewh., Nat. Hist. Cetacea, p. 263.
1849. *Octopus arcticus*, Prosch, K. Dansk. Vidensk. Selsk. Skriv., Rk. 5, Bd. i. p. 53, figs. 1–3.
1856. „ „ Stp., Hectocotyl., p. 201, Tav. ii. fig. 2.
1873. „ *Bairdii*, Vll., Amer. Journ. Sci. and Arts, vol. v. p. 5.
1878. „ „ Sars, Moll. Reg. Arct. Norv., p. 339, pl. xxxiii. figs. 1–10.
1881. „ „ Vll., Ceph. N. E. Amer., pp. 368, 421, pl. xxxiii. fig. 1; pl. xxxiv. figs. 5, 6; pl. xxxvi. fig. 10; pl. xxxviii. fig. 8; pl. xlix. fig. 4; pl. li. fig. 1.

Habitat.—Station 57, Færöe Channel, H.M.S. "Porcupine" Expedition, 1869; lat. 60° 14′ N., long. 6° 17′ W.; 632 fathoms. One specimen, ♂.

Station 65, Færöe Channel, H.M.S. "Porcupine" Expedition, 1869; lat. 61° 10′ N., long. 2° 21′ W.; 345 fathoms. Three specimens, one ♂, two immature.

Station 8, Færöe Channel, H.M.S "Knight Errant" Expedition, August 17, 1880; lat. 60° 3′ N., long. 5° 51′ W.; 540 fathoms; ooze. Two specimens, one ♂, one ♀.

[1] Hectocotyl., p. 201, Tav. ii. fig. 2.

Station 9, Færöe Channel, H.M.S. "Triton" Expedition, August 23, 1882; lat. 60° 5′ N., long. 6° 21′ W.; 608 fathoms; mud. One specimen, ♂.

Greenland (Dewhurst); north-east coast of the United States, 85 to 843 fathoms (Verrill); coast of Norway (Sars).

A few words are necessary regarding the synonymy of this species as given above. The number and beauty of the drawings, which Professor Verrill has given of his types, have enabled me to establish beyond any doubt their identity with the specimens obtained from the Færöe Channel; it is equally certain that the form figured by Professor Sars is conspecific with them. That the specimens in my hands are the same as *Octopus arcticus*, Prosch, I was able to establish in 1884 when I had the opportunity of comparing them with the types in the Copenhagen Museum. The identity of this form with *Octopus grænlandicus* (Dewhurst) cannot be proved, unless it were shown that only one species of *Octopus* occurs on the coast of Greenland, the original description being quite valueless.

Octopus pictus, Brock.

1882. *Octopus pictus*, Brock, Zeitschr. f. wiss. Zool., Bd. xxxii. p. 603, pl. xxxvii. fig. 3 (*non* Verrill).
1883. „ *maculosus*, Hoyle, Proc. Roy. Phys. Soc. Edin., vol. vii. p. 319, pl. vi.
1884. „ „ E. A. Smith, "Alert" Report, p. 36, pl. iv. fig. c.

Habitat.—Port Jackson, Australia (Brock, E. A. Smith); Australia (Hoyle).

To me, personally, a melancholy kind of interest attaches to this species, for it is the first I ventured to describe, being unaware that Dr Brock had, a few months previously, as an appendix to the elaborate anatomical work above quoted, described several new species, among which the present form was one.

Although this species does not occur in the Challenger collection, it appears desirable to mention it here partly as introductory to the following variety, and partly for the sake of rectifying the synonymy.

Brock's original diagnosis may be translated here: "Mantle of the specimen, preserved in alcohol, slightly broader than long. The arms are subequal, not very long compared with the body, and in order of length 3, 2, 4, 1. The second and third pairs are almost exactly equal, and not quite twice as long as the body. Arms tapering constantly towards the tips. Suckers in two regularly alternating series continually decreasing in size. The first three or four smaller than the rest and arranged in a single series. Umbrella equally but slightly developed. Ocular cirri wanting.

"Ventral and inner sides of the arms dull ochre yellow, dorsal and outer sides of the arms darker, somewhat regularly marked with large blackish brown spots, fused at the

edges, and exhibiting a black ring in the centre sharply marked off from the brown ground. Under the lens the dark spots are resolved into aggregations of chromatophores, and it may also be observed that the rings are more deeply placed and shine through the spots, and are therefore probably due to a fixed pigment in the deeper layers of the cutis. The brown spots on the arms bear no rings.

"The distribution of colour in this species is so characteristic that it can hardly be confused with any other hitherto known. The only known specimen (unfortunately defective) is in the Göttingen collection, and was presented by Dr. Schütte of Sydney."

The specimen which came into my hands bore the label "Australia," and I have since seen two in the British Museum from Port Jackson and Kangaroo Island, South Australia, and also four specimens in the Liverpool Free Public Museum, and one in the Museum of the Royal College of Surgeons, London, from unknown localities.

This species furnishes an admirable instance of the uselessness of slight variations in the lengths of the arms as specific characters; a number of specimens which have been examined with respect to this point giving the following results:—

Type specimen, ...	3 and 2 subequal, 4, 1.
Specimen in my own collection, . .	4, 1 and 3 equal, 2.
Four specimens in the Liverpool Museum,[1]	A 3, 4, 2, 1 on one side; 4, 2, 1, 3 on the other. B 3, 4, 2, 1. C 3, 4, 2, 1 (probably; arms much curled). D 2, 3, 1, 4 on one side, doubtful on the other.
"Alert" specimen, ...	2, 3 and 4 subequal, 1.

The example in the British Museum from Kangaroo Island has a curious thin pointed process about 6 mm. long at the aboral end of the body, which led to its receiving a special MS. name, but in all other respects it agrees so closely with *Octopus pictus* that I am inclined to regard it as an individual abnormality.

This specific name appears to have been applied by Blainville to the animal now known as *Parasira catenulata*, at least d'Orbigny quotes *Octopus pictus*, Blainville, with a reference to "Faune française, mollusques" as one of its synonyms, with the addition "d'apres Risso," in whose writings I have been unable to find any allusion to the matter. In this case, seeing that there seems to be some doubt as to Blainville's application of the name, and as it has, at all events, never obtained currency, it seems right to allow Brock's name, which has the priority in reference to the present species, to stand.

Professor Verrill has described a new species of *Octopus*[2] for which he has selected the name "*pictus*," being apparently unaware of its appropriation by Brock; it is quite certain that the two forms are distinct, and therefore as Verrill's name must be changed, I propose that his species should be known as *Octopus verrilli*.

[1] I am indebted to my friend Professor Herdman for measuring these specimens.

[2] "Blake" Suppl., p. 112, pl. iii. fig. 3.

Octopus pictus, Brock, var. *fasciata*, nov. (Pl. VIII. fig. 3).

Habitat.—Port Jackson, Australia, April 23, 1874; 6 to 15 fathoms.

The variety differs from the typical form (1) in the somewhat elongated not spheroidal shape of the body, (2) in the inequality in the shape of the arms, (3) in the prominence of the suckers; none of which are points of great importance, being possibly due to varying states of contraction.

On the other hand, it agrees in the type of colouring, but here the dark pigment is arranged in continuous bands, which are not broken up into rounded patches as is the case in all the specimens I have seen; the spots of the type are, however, arranged in rows disposed similarly to the bands. Furthermore, each band contains an opaque-looking median streak like the centre of the spots, and the number of transverse stripes on the arms corresponds roughly in both forms.

Octopus bermudensis, Hoyle (Pl. II. fig. 5).

1885. *Octopus bermudensis*, Hoyle, Diagnoses I., p. 228.
1885. „ „ Hoyle, Prelim. Rep. I., p. 103.

Habitat.—Bermuda. One young specimen, ♀.

The Body is spheroidal, acuminate behind, and with a median groove ventrally. The *mantle-opening* extends rather less than half round the circumference of the body, and terminates some distance behind and a little below the eye. The *siphon* is long and smooth, and attached by nearly all its length to the head; it extends fully halfway to the umbrella-margin.

The Head is much narrower, and more depressed than the body; the *eyes* are scarcely at all prominent.

The Arms are unequal, in the order 1, 2, 3, 4; about six times as long as the body; they are very long and slender, tapering but slightly. The *umbrella* is small. The *suckers* are small, prominent, and closely set, and the first four stand in a slightly zigzag line. The only specimen being a female, no *hectocotylised arm* was observed.

The Surface is smooth for the most part, but the skin is wrinkled over the posterior acuminate extremity, owing to the action of the spirit; there is one very small wart over each eye.

The Colour is yellow ochre, with a pale sienna patch on the back and one on the head.

Dimensions.

Length, total,	58 mm.
End of body to mantle margin,	10 „

	Right.	Left.
Length of first arm,	50 mm.	48 mm.
Length of second arm,	43 „	40 „
Length of third arm,	38 „	38 „
Length of fourth arm,	30 „	32 „

This specimen is probably immature, but its characters are so well marked that I have little hesitation in making it the type of a new species; it differs from *Octopus pusillus*, Gould, in the very small size of the umbrella, and from *Octopus aranea*, d'Orb., which it resembles in the length of its arms, in the fact that here it is the dorsal, there the ventral arms, which markedly exceed the others. The arms are much longer than in *Octopus eudora*, Gray.

Octopus macropus, Risso.

1814. *Octopus ruber* (*?*), Raf., Précis découv. somiol., p. 28.
1826. „ *macropus*, Risso, Hist. Nat. Eur. Mérid., t. iv. p. 3.
1826. „ *Cuvierii*, d'Orb., Céph. acét.; Poulpes, pl. iv. (*nomen tantum*).
1838. „ *Cuvieri*, d'Orb., Céph. acét., p. 18; Poulpes, pls. i., iv., xxvii.
1851. „ *macropus*, Vér., Céph. médit., p. 27, pl. x.
1869. „ „ Targ., Cef. Mus. Firenze., p. 23.
1869. „ *Cuvieri*, Targ., Cef. Mus. Firenze., p. 24.
1886. „ „ Appellöf, Japanska Ceph., p. 6, pl. i. fig. 6.

Habitat.—Yokohama, Japan, purchased in the market. One specimen, ♀.

Canaries, Indian Ocean, Red Sea (d'Orbigny); Japan (Appellöf); Mediterranean (Risso, d'Orbigny, Vérany, &c.); Adriatic (Ninni).

This specimen agrees with d'Orbigny's description in every particular except that the "cirrhe postérieur médiane" could not be found, but as the skin in that region was much wrinkled and contracted, that is not a matter of much moment, especially as, according to Vérany, its presence is not constant.

The synonymy of this species requires a little notice; and in regard to it two questions arise:—Are *Octopus macropus* and *Octopus cuvieri* to be regarded as one species?—and if so, what name is that species to bear?

Two of the greatest authorities who have written on the subject, Vérany and d'Orbigny, unite them, but under different names, while the only modern writer who separates them is Targioni-Tozzetti (*loc. cit.*). Not having sufficient material to form an opinion on the subject, I wrote asking the opinion of my friend Dr. Jatta, of the Naples Zoological Station, who has an extensive knowledge of the Cephalopoda of the

Mediterranean. He is of opinion that they are identical, and that view I have adopted in the present Report.

As regards the name, seeing that Risso's was accompanied by a description in a published book, while d'Orbigny's was merely inscribed at the bottom of a plate which appears to have been in the first instance privately distributed, it appears right to adopt that of the former author.

What the *Octopus ruber* of Rafinesque really was will probably always remain doubtful. Cantraine[1] adopted the name for this species because its colour is generally ruddy, but the account of the length of the arms ("antenopes égaux, environ le double du corps") is strongly at variance with this hypothesis.

Octopus bandensis, Hoyle (Pl. VII. figs. 9, 10).

1885. *Octopus bandensis*, Hoyle, Diagnoses I., p. 227.
1885. „ „ Hoyle, Prelim. Rep. I., p. 102.

Habitat.—Banda. One young specimen.

The Body is rounded and depressed (? from pressure), and with a slight ventral groove. The *mantle-opening* terminates immediately below and behind the eye. The *siphon* extends as far as the umbrella-margin, and is acutely pointed.

The Head is broader than the body, and flattened by compression; the *eyes* are very prominent.

The Arms are unequal, the third pair being much the longest and stoutest; on the average they are four times as long as the body; they taper gradually at first, and then more rapidly. The *umbrella* is very small. The *suckers* are prominent, the first four being disposed in a single series (incorrectly shown on Pl. VII. fig. 10); and none are enlarged on the lateral arms. No *hectocotylised arm* was present in the single specimen.

The Surface is smooth in general, but there are about twelve warts on the back and sides of the body, and a large cirrus over each eye, with several smaller ones near it.

The Colour is deep black, apparently owing to treatment with osmic acid.

Dimensions.

Total length,	25 mm.
End of body to eye,	6 „

This minute specimen presents so striking an elongation of its third pair of arms as compared with the others that it is impossible to refer it to any hitherto known species.

[1] Malacol. médit., p. 18.

Octopus januarii, Steenstrup, MS. (Pl. VII. figs. 1–4).

... *Octopus januarii*, Steenstrup, MS. in Mus. Havn.
1885. „ „ Hoyle, Diagnoses I., p. 229.
1885. „ „ Hoyle, Prelim. Rep., p. 105.

Habitat.—Station 122, off Barra Grande, Brazil, September 10, 1873; lat. 9° 5′ S., long. 34° 50′ W.; 350 fathoms; red mud. One specimen, ♂.

Station 237, North Pacific, east of Japan, June 17, 1875; lat. 34° 37′ N., long. 140° 32′ E.; 1875 fathoms; blue mud. One specimen, ♂.

Rio Janeiro (Copenhagen Museum).

The Body is rounded, widening a little posteriorly; the ventral groove is very faint. The *mantle-opening* terminates just below the eyes. The *siphon* is bluntly conical, and extensively attached to the umbrella; it extends less than halfway to the umbrella margin.

The Head is small, and the sides are entirely occupied by the enormous *eyes*, which are swollen and globular, but with very small palpebral openings. The skin covering them is so thin that the dark pigment within is distinctly visible.

The Arms are unequal, the dorsal pair being the largest; on an average they are six times as long as the body. The *umbrella* is about equally wide all round, except that it is a little shorter between the two ventral arms.

The Suckers are comparatively small, prominent, and separate; more widely in one specimen than in the other, probably owing to its being less contracted by spirit. None of the suckers on the lateral arms are enlarged, notwithstanding the sex. The extremity of the *hectocotylised arm* is well developed; it is broad, and tapers rapidly to an acute point; in one specimen about seven transverse ridges can be counted in the proximal half of the median groove; in the distal half and in the other specimen they are indistinct (Pl. VII. fig. 2).

The Surface is perfectly smooth all over.

The Colour is a pale purplish-pink; deeper above than below.

The Jaws are shown in Pl. VII. figs. 3, 4.

Dimensions.[1]

Length, total,	285 mm.
End of body to mantle margin,	35 „
End of body to eye,	47 „
Breadth of body,	42 „
Breadth of head,	32 „
Eye to edge of umbrella,	58 „
Length of tip of hectocotylised arm,	10 „
Breadth of tip of hectocotylised arm,	4 „
Diameter of largest sucker,	3·5 „

[1] The measurements are from the Barra Grande specimen; it was in better condition than the other, which had also a length of about 290 mm. The lengths of the arms are measured from the eye.

	Right.	Left.
Length of first arm,	250 mm.	225[1] mm.
Length of second arm,	230 „	220 „
Length of third arm,	145 „	160 „
Length of fourth arm,	165 „	160 „

The two specimens in the Challenger collection agree in all essential particulars with several in the Copenhagen Museum, so that I have gladly adopted Professor Steenstrup's MS. name for the species, recalling the fact that it was first obtained off Rio Janeiro.

On a recent visit to Paris, Dr. Paul Fischer showed me some specimens of an *Octopus* obtained in large numbers by the "Talisman"; from the hurried glance, which was all I could give them, they seemed to present a considerable resemblance to this form, but without further examination it would be impossible to form any opinion as to their identity.

It is not a little remarkable that the same species of *Octopus* should be found in such diverse localities as is here the case; it is further noticeable that the smaller specimen furnishes one of the very few instances in which an *Octopus* was brought up by the deep-sea dredge or trawl, the genus being usually found only in comparatively shallow water. If Dr. Fischer's specimens should prove to belong to the same species the opinion would be forcibly suggested that we have here to do with a veritably abyssal *Octopus*.

Octopus levis, Hoyle (Pl. II. figs. 1–4; Pl. III. fig. 1).

1885. *Octopus levis*, Hoyle, Diagnoses I., p. 229.
1885. „ „ Hoyle, Prelim. Rep. I., p. 104.

Habitat.—Station 151, off Heard Island, Southern Ocean, February 7, 1874; lat. 52° 59′ 30″ S., long. 73° 33′ 30″ W.; 75 fathoms; volcanic mud. Four specimens, one ♂, one ♂ immature, two ♀ immature.

The Body is oblong, depressed, and bulges a little at the sides. The *mantle-opening* extends about one-third round the circumference, terminating about midway between the siphon and the eye. The *siphon* is short and small, extending scarcely one-third the distance to the umbrella-margin.

The Head is almost as broad as the body; and the *eyes* are large, spheroidal, and prominent, with very small circular apertures.

The Arms are subequal and short, compared with the body, being about three times its length; they taper gradually to moderately fine points. The *umbrella* is large, extending about one-third of the arms. The *suckers* are small and prominent, and arranged in two rows from the commencement (Pl. III. fig. 1); a narrow well-marked

[1] The extreme tip is wanting.

groove runs across the arm between each two suckers (possibly due to contraction). The extremity of the *hectocotylised arm* is well-developed, short, and tapering rapidly to a blunt point; the median groove has about ten transverse bars (Pl. I. fig. 2). The *circumoral lip* is unusually thick (Pl. III. fig. 1).

The Surface appears to have been perfectly smooth,[1] but is now covered with wrinkles, due to the action of the spirit.

The Colour is a dull grey, inclining to stone-colour below.

The Jaws are shown in Pl. II. figs. 3, 4.

Dimensions.

Length, total,	190 mm.
End of body to mantle margin,	43 „
End of body to eye,	50 „
Breadth of body,	40 „
Breadth of head,	35 „
Eye to edge of umbrella,	50 „
Length of extremity of hectocotylised arm,	7 „
Breadth of extremity of hectocotylised arm,	4 „
Diameter of largest sucker,	3 „

	Right.	Left.
Length of first arm,[2]	125 mm.	140 mm.
Length of second arm,	130 „	140 „
Length of third arm,	100 „	130 „
Length of fourth arm,	135 „	130 „

The establishment of this species is more than usually satisfactory, being based upon no less than four specimens; and although three of these were of small size, yet they agree so well with the large one that there would be no doubt as to their identity even had they not been obtained at the same Station.

In some respects, for instance, in the absence of cirri, and in its smooth skin, it resembles *Octopus tehuelchus*, d'Orbigny, but the specimens differ from the latter so very markedly in colour (d'Orbigny's form being of a deep blackish-brown), and in some minor points, that there is no doubt they are distinct.

In its smoothness and in the form and dimensions of the extremity of its hectocotylised arm it also resembles *Octopus januarii*, Steenstrup, but it is certainly distinct. From *Octopus favonia*, Gray, it differs in the presence of a stout circumoral lip, and in the double row of cups reaching quite up to it (Pl. III. fig. 1); the latter is in most cases a comparatively insignificant character, but seems to be of more value in the present instance because the arms were strongly bent back from the mouth, a condition in which the suckers would naturally tend to form a single series.

[1] Hence the specific name.

[2] The lengths of the arms are measured from the margin of the mouth.

Octopus punctatus, Gabb (Pl. V.).

1862. *Octopus punctatus*, Gabb, Proc. Calif. Acad., vol. ii. p. 170.
1866. „ „ Dall, *Ibid.*, vol. iii. p. 243, fig. 27.
1883. „ „ Vll., "Blake," Suppl., p. 117, pls. iv., v., fig. 2.
1885. „ *hongkongensis*, Hoyle, Diagnoses I., p. 224.
1885. „ „ Hoyle, Prelim. Rep. I., p. 99.

Habitat.—Station 232, the *Hyalonema*-ground, off Ino Sima Island, Japan, May 12, 1875; lat. 35° 11′ N., long. 139° 28′ E.; 345 fathoms; green mud. One specimen, ♂.

Pacific Coast, San Francisco to Sitka, Alaska (Verrill); Hong Kong (Copenhagen Museum).

This species was identified in the summer of 1884 by comparison with four specimens which had been named by Steenstrup, *Octopus hongkongensis*, and although the Challenger example greatly exceeded them in size, it nevertheless agreed with them so remarkably in the form of the minute pimples on the body and in the shape and proportions of the hectocotylised arm, that there could be no doubt they all belonged to the same species. Since that time Professor Verrill has kindly sent me a copy of his descriptions of two species of *Octopus* from California (*op. cit.*), and a comparison of his account of *Octopus punctatus*, with the Challenger specimen from Japan, has convinced me that they must all be referred to one type, which will of course bear the name selected by Gabb.

A large sucker, some 30 mm. or more in diameter, in the British Museum, seems to me almost certainly to have belonged to an individual of this species.

I append the dimensions of the Challenger specimen for comparison with those given by Verrill; the length of the arms seems to be very variable.

Dimensions.

Length, total,	650 mm.
End of body to mantle-margin,	70 „
End of body to eye,	90 „
Breadth of body,	90 „
Breadth of head,	65 „
Eye to edge of umbrella (dorsally),	130 „
Eye to edge of umbrella (laterally),	150 „
Length of extremity of hectocotylised arm,	31 „
Breadth of extremity of hectocotylised arm,	4 „
Diameter of largest sucker,	11 „

	Right.	Left.
Length of first arm,	510 mm.	530 mm.
Length of second arm,	520 „	500 „
Length of third arm,	290 „	440 „
Length of fourth arm,	355 „[1]	410 „

[1] The extremity is missing.

Octopus brevipes, d'Orbigny.

1838. *Octopus brevipes*, d'Orb., Céph. acét., p. 61; Poulpes, pl. xvii. fig. 1.

Habitat.—North Pacific, April 3, 1875; lat. 24° 49′ N., long. 138° 34′ E.; surface. One specimen.

North Atlantic; lat. 23° N., long. 32° W. (d'Orbigny).

A small specimen (11 mm. long) in the collection resembles d'Orbigny's figure so closely that I apply his name to it. The colour, however, is much darker along the dorsal surface of the arms; it is almost certain that both are young forms, perhaps of two distinct species.

Octopus sp.

Habitat.—Station 188, south of Papua, September 10, 1874; lat. 9° 59′ S., long. 139° 42′ E.; 28 fathoms; green mud. One specimen.

An immature specimen, which could not be determined, was obtained at this Station.

Octopus sp.

Habitat.—Station 184, east of Cape York, August 29, 1874; lat. 12° 8′ S., long. 145° 10′ E.; 1400 fathoms; Globigerina ooze. One specimen.

At this Station the trawl brought up some fragments of an *Octopus*, which it was quite impossible to determine.

Eledone, Leach.

The species of this genus are exceedingly difficult to discriminate, and it is by no means certain into how many even the commonly occurring European forms should be divided.

The difficulties are of the same kind as those encountered in the genus *Octopus*, and the remarks made under that heading (see p. 74) apply equally here also.

It seems necessary to go to some extent into the history of this generic name, since Dr. de Rochebrune has recently discussed it [1] and arrived at a conclusion whither I can hardly follow him.

For the present purpose it is not necessary to refer to any pre-Linnean authors, for, as Dr. de Rochebrune himself admits, they are not to be considered in cases of priority; we have therefore merely to inquire who was the first after the year 1758 (or 1766) to formally establish the present genus. In the year 1817, Leach wrote, in the Zoological Miscellany (vol. iii. p. 137), thus, "Pedes antliis simplice serie instructi, consimiles,

[1] Monogr. Eledonidæ.

1. Eledone,"[1] in 1826, d'Orbigny enumerated the genus by the same name in his "Tableau méthodique";[2] and in the same year Risso also adopted the genus but altered the spelling to "*Eledona*," either with the view of approximating it to customary Latin spelling, or merely following the example of Belon, Aldrovandus, and others.

The conclusion which de Rochebrune draws from these facts is that Risso is the author of the genus. This seems to me quite untenable, and calculated to lead to the utmost confusion, in addition to which it is obviously unjust to give to a writer who merely makes a literal alteration in the spelling of a word the credit of founding the genus. A few examples will make my meaning clear. In 1835 d'Orbigny separated Blainville's "Calmars flêches" as a distinct genus *Ommastrephes*, since which some other authors, of whom I believe Lovén[3] was the first, have preferred to spell it *Ommatostrephes;* but are we therefore to speak of it as "*Ommatostrephes*, Lovén, 1847"? Again the year before last, Dr. de Rochebrune himself thought fit to erect *Loligopsis ellipsoptera*, Adams and Reeve, into a genus "*Dyctydiopsis*." This is in distinct violation of the ordinary rule for transliterating Greek words, whereby ι should become *i* not *y*, but if, in adopting his genus, I were to make this correction, I do not think any future writer, even though he might approve of this spelling, would be justified in calling the genus "*Dictydiopsis*, Hoyle, 1886."

The question whether Risso's proposed alteration was desirable or not does not affect the question; it may well be left as a matter of opinion. To me, I confess, it seems that *Eledone* is the preferable form, and as it has priority I prefer to use it; indeed I should be loth to interfere with any published spelling except on the ground of flagrant inaccuracy.

Eledone cirrosa (Lamarck), d'Orbigny.

1776. *Sepia octopodia* (*?*), Pennant, Brit. Zool., vol. iv. p. 53, pl. xxviii. fig. 44.
1799. *Octopus cirrhosus*, Lmk., Mém. Soc. Hist. Nat. Paris, t. i. p. 21, pl. i. fig. 2.
1814. *Ozoena aldrovandi* (*?*), Raf., Précis découv. somiol., p. 29.
1827. *Octopus ventricosus*, Grant, Edin. N. Phil. Journ., p. 309.
1829. „ *aldrovandi*, d. Ch., Mem. stor. nat., pp. 45, 57, tav. lvi.
1838. *Eledone cirrhosus*, d'Orb., Céph. acét., p. 79; Elédons, pl. ii.
1843. „ *pennantii*, Macgillivray, Moll. Anim. Scot., p. 31.
1843. „ *aldrovandi* (*?*), Macgillivray, *Ibid.*, p. 32.
1851. „ *aldrovandi*, Vér., Céph. médit., p. 12, pls. ii., iii.
1851. „ *genei*, Vér., *Ibid.*, p. 15, pl. i.
1853. „ *cirrhosus*, Forbes and Hanley, Brit. Moll., vol. iv. p. 211, pl. KKK fig. 4; pl. MMM fig. 1.
1869. „ *cirrosa*, Jeffreys, Brit. Conch., vol. v. p. 146, pl. vii. fig. 2.

Habitat.—Off the Butt of Lewis, H.M.S. "Triton" Expedition, August 25, 1882; 40 fathoms. One specimen, ♀.

[1] De Rochebrune is in error when he states (*op. cit.*, p. 153) that Leach used the form "Eledon."
[2] *Ann. d. Sci. Nat.*, t. vii. p. 145. [3] *Öfversigt k. Svensk. Vetensk. Akad. Förhandl.*, Årgången, p. 135, 1846.

Off Wexford, H.M.S. "Porcupine" Expedition, 1869. One specimen, ♀.

Britain (Pennant, Forbes and Hanley, Jeffreys); Norway (Lovén, Steenstrup); Mediterranean (as *Eledone aldrovandi*, Vérany).

Of this species I have examined a considerable number from our own coast as well as some from other localities, and feel pretty confident that the table of synonyms above given, though long, is correct. I have compared some specimens of *Eledone aldrovandi* received from the Zoological Station at Naples, with young specimens from our own coast, and can detect absolutely no points of specific importance between them.[1] Older specimens, as compared with the young ones, are proportionately longer in the body, the tubercles on the back are more prominent, and the arms better developed. One or two specimens from the east coast of Scotland are quite smooth, but I am disposed to attribute this to their having been kept some time after death before being placed in spirit, an opinion confirmed by their soft flabby consistency.

The contraction due to this reagent often causes a disposition of the suckers in two series on longer or shorter portions of the arms, and in some cases this is so consistent and regular that it would not be difficult on cursory examination to mistake the specimen for an *Octopus*.

Not having seen a male, I have been unable to confirm Steenstrup's observation regarding the structure of the extremities of the arms in that sex.[2] He found in a specimen from Bergen that the suckers ceased a little below the tip, and were replaced by pairs of minute cirri; it would be very desirable to repeat this observation because Steenstrup remarks that his specimen was in poor condition, and because the specimens of *Eledone aldrovandi* from Naples disagree in this respect with his description, but resemble *Eledone moschata* in possessing not cirri but cuticular folds at their ends; this structure is figured by Steenstrup,[3] and is visible on specimens sent me from Naples. If the male *Eledone cirrosa* really possesses these paired threads it would tend to prove that *Eledone aldrovandi* was not identical with it, but, as above remarked, I have been unable to separate them by any external characters.

What Macgillivray's *Eledone aldrovandi* was it seems impossible to determine with any certainty; it may have been a distorted specimen of the present species, but in any case the name must be dropped.

Eledone octopodia (Pennant) has been adopted by some authors as a name for this species, but even if it could be proved beyond question that Pennant's *Sepia octopodia* is identical with it, then his name would not take precedence of the others, because he did not name the species at all, but merely referred it erroneously to Linné's type, which we now know as *Octopus vulgaris*.

[1] I have just ascertained that the identity of *Eledone cirrosa* (*Eledone pennanti*) with *Eledone aldrovandi* has been already suggested by Dr. Paul Fischer (*Journ. de Conch.*, sér. 3, t. vii. p. 13, 1867).

[2] Hectoctyl, p. 206, Tav. ii. fig. 6.

[3] *Op. cit.*, Tav. ii. fig. 5.

Eledone verrucosa, Verrill.

1881. *Eledone verrucosa*, Vll., "Blake" Report, p. 105, pls. v., vi.
1881. „ „ Vll., Ceph. N. E. Amer., p. 330, pls. lii., liii.
1884. „ „ Vll., Second Catal., p. 248.

Habitat.—Station 170A, off the Kermadec Islands, north of New Zealand; July 14, 1874; lat. 29° 45′ S., long. 178° 11′ W.; 630 fathoms; volcanic mud. One specimen, ♂.

North Atlantic, south east of Long Island; off Nantucket; off Martha's Vineyard; off Delaware Bay; 466–1255 fathoms (Verrill).

The agreement between the Challenger specimen and the admirable drawings and description of Professor Verrill is so close that there can be no doubt as to the correctness of this identification. The only differences appear to be that in the American specimens the cirri round and above the eyes are a little more prominent than in that from the Pacific, while the latter has the extremity of the hectocotylised arm formed like that of an *Octopus* rather than like that of an *Eledone*, as shown in Verrill's figure. The Challenger specimen, moreover, has the second pair of arms the longest, the first come next, while the third and fourth are subequal and still a little shorter; but as appears from Verrill's measurements (*loc. cit.*), these proportions are liable to variation.

The point of greatest interest in connection with this specimen is its capture so far away from the original habitat of the species, but this, as will appear in the sequel, is not without parallel (see p. 223).

Eledone rotunda, Hoyle (Pl. VIII. figs. 4–6).

1885. *Eledone rotunda*, Hoyle, Diagnoses I., p. 230.
1885. „ „ Hoyle, Prelim. Rep. I., p. 105.

Habitat.—Station 157, in the Southern Ocean, March 3, 1874; lat. 53° 55′ S., long. 108° 35′ E.; 1950 fathoms; Diatom ooze. One specimen, ♀.

Station 298, off Valparaiso, November 17, 1875; lat. 34° 7′ S., long. 73° 56′ W.; 2225 fathoms; blue mud. One specimen (arms only), ♀.

The Body is spheroidal, very little longer than broad, and the ventral groove is not marked. The *mantle-opening* extends one-third round the body, ending some distance directly below the eyes. The *siphon* is slightly tapering, and extends one-third the distance to the umbrella margin.

The Head is short, nearly as broad as the body, and the *eyes* are round and rather prominent.

The Arms are equal, and about twice as long as the body; they are very stout,

and taper gradually to blunt points; their section shows a triangle projecting inwards, and a rounded surface looking outwards; the former much more prominent than the latter. The *umbrella* is wide, extending one-third up the arms, a little further dorsally than ventrally. The *suckers* are comparatively small, closely set, and deeply cupped. No *hectocotylus* was found on either specimen, hence they are considered to be females, a supposition subsequently verified in the case of the one whose body was preserved.

The Surface is perfectly smooth.

The Colour is dull purple, palest on the body, and deepest on the inner surface of the umbrella.

The Jaws are shown on Pl. VIII. figs. 5, 6.

Dimensions.

Length, total,	165 mm.
End of body to mantle-margin,	45 „
End of body to eye,	55 „
Breadth of body,	45 „
Breadth of head,	35 „
Eye to edge of umbrella,	50 „
Diameter of largest sucker,	3 „

	Right.	Left.
Length of first arm,[1]	100 mm.	105 mm.
Length of second arm,	105 „	100 „
Length of third arm,	110 „	100 „
Length of fourth arm,	110 „	105 „

The better preserved of these two specimens is of interest as having come from the Southern Ocean, of the fauna of which we have but scanty reports; the mangled remains of another from the South Pacific, which have been referred with some doubt to the same species, indicate that it may perhaps have a wide range in deep water, for both examples appear to be from a depth of about 2000 fathoms.

Eledone brevis, Hoyle (Pl. VIII. fig. 7).

1885. *Eledone brevis*, Hoyle, Diagnoses I., p. 230.
1885. „ „ Hoyle, Prelim. Rep. I., p. 106.

Habitat.—Station 320, off Monte Video, February 14, 1876; lat. 37° 17′ S., long. 53° 52′ W.; 600 fathoms; green sand. Three specimens, ♀.

The Body is short, rounded, and depressed; blunt behind, and deeply grooved below. The *mantle-opening* extends one-third round the animal, and terminates immediately below the eyes. The *siphon* is short, acutely pointed, and extends less than halfway to the umbrella margin.

[1] The lengths of the arms are measured from the eye.

The Head is short, and nearly as broad as the body. The *eyes* are spheroidal, and very prominent.

The Arms are equal, and about half as long again as the body; they are short, stout, and taper gradually to blunt points. The *umbrella* extends halfway up the arms,—rather more in the largest specimen. The *suckers* are round, prominent, and deeply cupped, and there are about thirty on each arm. The *hectocotylus* is not present on any of the specimens, all being females.

The Surface is smooth, with the exception of three cirri arranged in a triangle over each eye. (By a mistake of the lithographer the cirri are represented as *below* the eye.) Behind the left eye in the largest specimen the skin is elevated into a number of small papillæ, and a few similar ones are seen on the back of the medium-sized specimen.

The Colour is a dull purplish-grey above, inclining to pale ochre below.

Dimensions.

Length, total,	55 mm.
End of body to mantle-margin,	15 „
End of body to eye,	20 „
Breadth of body,	22 „
Breadth of head,	20 „
Eye to edge of umbrella,	23 „
Diameter of largest sucker,	1 „

	Right.	Left.
Length of first arm,	35 mm.	35 mm.
Length of second arm,	35 „	35 „
Length of third arm,	31 „	31 „
Length of fourth arm,	30 „	30 „

The three little specimens of *Eledone*, trawled off the mouth of the Rio de la Plata, are not like any others of the genus known to me. The short arms, the smooth or slightly roughened dorsal surface, and three well-marked constant cirri over each eye, are very characteristic.

Eledonella, Verrill.

Japetella, Hoyle (*pars*).

This genus was created by Verrill in 1884[1] for a small *Eledone*-like Cephalopod dredged by the U.S. Fish Commission Steamer "Albatross" off the American coast in 2949 fathoms. In March of last year, not having then received Professor Verrill's paper, I described a very similar form from the Pacific Ocean under the name *Japetella*, a genus erected for it and for another form from the South Atlantic, for which I have still retained it, the two forms being clearly distinguished by the presence

[1] Second Catal., p. 14.

or absence of a median septum in the branchial cavity. Verrill does not appear to have opened the siphon of his specimen, for he does not allude to a pad in its dorsal wall; in the Challenger specimen this pad was free at its anterior extremity, forming a valve, but I am not sure that the separation was not artificial.

Eledonella diaphana, Hoyle (Pl. IX. figs. 3–6).

1885. *Japetella diaphana*, Hoyle, Diagnoses I., p. 232.
1885. „ „ Hoyle, Prelim. Rep. I., p. 108.

Habitat.—Station 220, north of Papua, March 11, 1875; lat. 0° 42′ S., long. 147° E.; 1100 fathoms (?); Globigerina ooze. One specimen, sex ?.

The Body is gelatinous and semitransparent; it is ovoid in form, and considerably longer than broad. The *mantle-opening* is very wide, extending up behind the eyes on either side. The *siphon* extends two-thirds of the distance to the umbrella margin, and is truncated at the extremity; it has a thick pad on its dorsal wall, which seems to form a valve by its free tip. There is a *median septum* in the branchial cavity (Pl. IX. fig. 4).

The Head is nearly as broad as the body, and the *eyes* are large and prominent; they consist of a larger, darkly pigmented spheroid, from which protrudes the opaque white, smaller, spheroidal lens.

The Arms are unequal; the longest (the third pair) are almost as long as the body, and are nearly twice as long as the fourth, which are the shortest, the order of length being 3, 2, 1, 4; they taper rapidly to fine points. The *umbrella* is very small, extending about one-fourth up the dorsal and ventral arms, a little further up the dorso-lateral and lateral arms, and being least developed in the space between the ventral and ventro-lateral arms (fig. 5). The *suckers* have assumed, probably owing to shrinking, a quadrangular or triangular form (fig. 6); they are prominent, and marked by two constrictions, one at the base, separating them from the arm, the other rather more than halfway up. There is no trace of any *hectocotylus*.

The Surface appears to have been smooth originally, but the epithelium has been to a great extent stripped off.

The Colour is very pale yellowish-grey, marked with numerous longitudinally disposed oblong chromatophores.

Dimensions.

Length, total,	36 mm.
End of body to mantle-margin,	16 „
End of body to eye,	18 „
Eye to edge of umbrella,	9 „
Length of third pair of arms,	18 „

In the Preliminary Report this specimen was recorded as being from the "surface," firstly, on the ground that it was so noted in the manuscript Station Book, kept during

the cruise, and, secondly, because of the pale semitransparent appearance which suggested its specific name. It seems better, however, to omit this and to leave the depth from which the specimen was taken an open question; there was, so far as I can ascertain, no objective evidence that the animal had been taken at the surface, and in the only two cases in which examples of this genus have been obtained the dredge or trawl had been to a great depth. Professor Steenstrup's five specimens of his *Bolitæna microcotyla*, a form nearly allied to this, were all taken in the surface net with Medusæ and other pelagic organisms at very distant localities.

The question as to the specific identity, or otherwise, of this form with that described by Verrill seems at present to admit of no decision; the extent of variation in a genus consisting at present of only two specimens is, of course, quite uncertain, the more so as these belong apparently to different sexes. It seems, therefore, that the interests of science will be best served by recording the two as distinct, though I have a strong suspicion that they will eventually be proved to be identical, and had the knowledge of Verrill's species come to me in time I should not have proposed a new name.

The present type resembles *Bolitæna*, Steenstrup, in the gelatinous consistency of the body, in the presence of a median septum in the branchial cavity, in the wide opening of the mantle, which extends to just behind the eyes, and in the preponderance of the third pair of arms. They differ, however, in a considerable number of important characters. In *Bolitæna microcotyla* the distance from the eye to the extremity of the arms is somewhat greater than from the eye to the end of the body, whereas in *Eledonella* it is only about half as great; and whilst in *Bolitæna* there are fourteen small widely separated suckers on the longest arm, in *Eledonella* there are sixteen larger ones closely placed. In *Bolitæna* the colour is a brownish-purple, with irregular dark brown mottlings, and a delicate web extends about halfway up the arms, while in *Eledonella* the colour is almost white, with elongated oval brownish spots, and the web extends only one-fourth up the dorsal arms, and to a somewhat less extent between the others.

The genus *Eledonella* furnishes one of the instances in which closely similar, if not identical, forms occur both in the Western Atlantic and the Western Pacific (compare pp. 184, 223).

Japetella,[1] Hoyle.

Body gelatinous in consistency and semitransparent, and more or less oblong in form. *Mantle-opening* very wide. *Siphon* provided with a *valve*. No *median septum* in the branchial cavity.

Arms unequal, and the longest only about equal in length to the body. *Umbrella* small, and the *suckers* arranged in a single series.

[1] Named in honour of Professor Japetus Steenstrup, whose brilliant researches have added so much to our knowledge of this group, and who examined this specimen and the one just described with peculiar interest.

Japetella prismatica,[1] Hoyle (Pl. IX. figs. 1, 2).

1885. *Japetella prismatica*, Hoyle, Diagnoses I., p. 231.
1885. „ „ Hoyle, Narr. Chall. Exp., vol. i. p. 271, fig. 107.
1885. „ „ Hoyle, Prelim. Rep. I., p. 107, woodcut.

Habitat.—Station 126, off the Rio San Francisco, Brazil, September 12, 1873; lat. 10° 46′ S., long. 36° 8′ W.; 770 fathoms; red mud. One specimen, probably ♀.

The Body is of gelatinous consistency and semitransparent; it is somewhat longer than broad, flat on the dorsum, and with the median ventral region raised into a prominent ridge, which gives the body a prismatic form (fig. 1). The *mantle-opening* appears to have been wide, and to have terminated behind the eyes; but as the integument has been torn away from the head dorsally, it is impossible to be certain of this. The *siphon* extends almost to the margin of the umbrella, and is but slightly conical, with a broad truncated extremity; internally it is provided with a distinct *valve*.

The Head is about as broad as the body; the *eyes* are rounded, and prominent laterally, the spherical lens protruding from the middle of each.

The Arms are unequal, the third pair being the largest, one quarter longer than the body, and about one-third longer than the fourth, which are slightly longer than the second, and these than the first, so that the order of length is 3, 4, 2, 1. The arms are stout, and taper gradually to blunt points. The *umbrella* extends about halfway up the dorsal arms and one-fourth up the ventral arms, its extent being intermediate between these extremes in the case of the other arms. The *suckers* are round and prominent, and in many cases show a double margin, due to a thin fold of skin surrounding the thickened edge of the sucker; they commence one sucker's breadth from the oral margin, and become gradually larger and wider apart as far as the middle of the arm, where they are one sucker's breadth apart, after which they are smaller and closer, and towards the extremity stand in contact. There is no trace of a *hectocotylus*.

The Surface of the body appears to have been perfectly smooth; it is covered with torn remains of epithelium, but there are neither warts nor cirri.

The Colour is a pale yellowish-grey, and there are numerous reddish-brown chromatophores.

Dimensions.

Length, total,	70 mm.
End of body to mantle-margin,	27 „
End of body to eye,	33 „
Breadth of body,	22 „
Breadth of head,	20 „
Eye to edge of umbrella,	19 „
Diameter of largest sucker,	1·5 „

[1] So called from the form of the body.

	Right.	Left.
Length of first arm,[1]	26 mm.	27 mm.
Length of second arm,	27 „	23 „ [2]
Length of third arm,	36 „	30 „ [2]
Length of fourth arm,	26 „	26 „

The genus *Japetella* was originally created for the reception of two forms, which however, differed in a character so important that they were only united provisionally. Since then the other species (*Japetella diaphana*) has been referred to *Eledonella*, Verrill, so that the present genus is monotypic. The distinguishing character is the median ventral septum in the branchial cavity, which, though present in *Octopus*, *Eledone*, *Cirroteuthis*, *Eledonella*, and *Bolitæna*, is absent in *Japetella*. The presence of a valve in the siphon is very remarkable.

This is another of the forms brought up by a trawl which had been down into deep water, and concerning whose real place of origin there is considerable uncertainty; its general similarity to *Eledonella* is so great that whatever decision is come to regarding the one, must be regarded *à priori* as probably true of the other.

Suborder II. DECAPODA, Leach.

Division I. MYOPSIDA, d'Orbigny.

Family VII. Sepiolini, Steenstrup.

Sepiola (Rondelet), Leach.

Sepiola rondeleti, Leach.

1558. *Sepiola rondeleti*, Gesner, De Aquat., lib. iv. p. 855.
1817. „ *Rondeletii*, Leach, Zool. Miscell., vol. iii. p. 138.
1839. „ „ d'Orb., Céph. acét., p. 230; Sépioles, pl. i. figs. 1–6; pl. ii. figs. 3–13; pl. iii. figs. 6–9.
1845. „ *oceanica*, d'Orb., Moll. viv., pl. x. fig. 13 (*err.*).
1853. „ *Rondeletii*, Forbes and Hanley, Brit. Moll., vol. iv. p. 220, pl. mmm. fig. 1.
1869. „ *Rondeletti*, Targ., Cef. Mus. Firenze, p. 45.
1869. „ *Rondeleti*, Jeffreys, Brit. Conch., vol. v. p. 136.
1879. „ *sepiola*, Tryon, Man. Conch., vol. i. p. 155.

Habitat.—The Minch, west coast of Scotland, "Porcupine" Expedition, 1869; 60 to 80 fathoms. Two specimens, ♀.

British Seas (Forbes and Hanley, Jeffreys); Atlantic coast of France (Fischer,

[1] The lengths of the arms are measured from the eye. [2] Mutilated.

Daniel); Mediterranean (d'Orbigny, Vérany); Adriatic (Ninni); Ægean (Forbes); Greenland (Steenstrup); Gorée, Senegal (Maltzan); Canaries (M'Andrew in Brit. Mus.).

The name by which this species has long been currently known has been called in question by Tryon (*loc. cit.*), who adopts the term *Sepiola sepiola*. According to the British Association rules, in their present form, there is no doubt that this view is correct, for the Linnean specific name takes precedence of all others, and it is not held to be necessary to change it even though it be erected into a generic name. At the same time it must be remembered that this last principle is only of modern adoption; it was the universal custom, even so lately as the first edition of the British Association rules, for any writer who converted a specific name to generic use to propose a new one in its place, and therefore Leach, when he created the genus *Sepiola*, followed the usual custom in selecting and giving currency to one taken from the pages of Gesner, who wrote in 1558. It must, of course, be understood that Gesner's designation is not a binomial name in the Linnean sense though it happens to consist of two words; it simply means to identify the animal as the one called "Sepiola" by Rondelet.

It seems best, on the whole, to perpetuate Leach's designation, 1st, because it has virtually, if not technically, the claim of priority; 2nd, because it was proposed by Leach in strict conformity with the usage of his time; and 3rd, because it has since found universal acceptance for the commonest of the Mediterranean species. According to Steenstrup[1] and others,[2] there seem to be about three of these; one of them may be identical with *Sepiola oweniana*, d'Orb.; although Tryon has referred a form from the Fiji Islands to this species.[3]

Gwyn Jeffreys' assertion (*op. cit.*, p. 137) that "the male (of this species) is *Sepiola atlantica* of d'Orbigny" is absolutely without foundation, and could only have been made in total ignorance of the sexual characters found in this genus, which were clearly set forth so long ago as 1856[4] by Steenstrup, whom Jeffreys himself rightly describes as "one of the greatest authorities on the Cephalopods." It is parallel to his statement (*op. cit.*, p. 131) that the distinction between *Loligo vulgaris* and *Loligo forbesii* is not valid because it is possibly sexual, being based mainly on the relative sizes of the suckers, although males of both species were described.

For the specimen from Gorée I am indebted to v. Maltzan as well as for some other specimens from the same locality.

[1] Mörch, *Vid. Meddel. nat. Foren. Kjøbenhavn*, p. 101, 1867.

[2] Targioni-Tozzetti, *op. cit.*, pp. 44, 45.

[3] Man. Conch., vol. i. p. 156.

[4] Hectocotyl., p. 197, and *Ann. and Mag. Nat. Hist.*, ser. 2, vol. xx. p. 91, 1857; see also Steenstrup, Sthenoteuthis og Lestoteuthis, p. 8.

Inioteuthis, Verrill.

Inioteuthis morsei, Verrill (Pl. XIV. figs. 1–9).

1881. *Inioteuthis Morsei*, Vll., Ceph. N.E. Amer., p. 417.
1884. *Scpiola bursa*, (?) Pffr., Ceph. Hamb. Mus., p. 6, fig. 6.
1886. *Inioteuthis Morsei*, Appellöf, Japanska Ceph., p. 15, pl. ii. figs. 15, 16; pl. iii. figs. 16, 19, 20, 23.

Habitat.—Station 233, off Kobé, Japan, May 17, 1875; lat. 34° 39′ N., long. 135° 14′ E.; 8 to 14 fathoms, mud. Four specimens, ♀.

Bay of Yedo (Verrill); Hong Kong (Pfeffer); Japan (Appellöf).

The Body is oblong, rounded behind and rather longer than broad; the *fins* are subcircular, notched at the anterior attachment to the body, but not at the posterior; they are about half as long and half as broad as the body. The *mantle* is attached to the head by a broad ligament reaching nearly the whole distance from eye to eye; the *mantle connective* is of the usual form. The *siphon* is long, slender, conical, slightly expanded at the extremity, and nearly reaches the gap between the ventral arms.

The Head is broad and the *eyes* prominent; the *lacrymal pore* below and anterior to the eye is in several specimens unrecognisable.

The Arms are unequal, the order being 2=3, 1=4; they are slightly longer than the body, conical and gradually tapering towards the extremities. The *suckers* are in four series, except a few (four to eight) proximal ones which are in two series (fig. 9), they are hood-shaped (figs. 2, 3) and oblique, with very slender peduncles from which they readily become detached. The *horny ring* is entire and surrounded by a narrow papillary area. The *hectocotylus* was not seen, all the specimens being females. The *umbrella* extends about equally between the first, second, and third arms, namely, about up to the fourth row of suckers, while between the third and fourth arms it reaches to the seventh row, and is entirely absent between the two ventral arms. The *buccal membrane* has six points, but no suckers. The *outer lip* is thin, the *inner* thick and papillate.

The Tentacles are nearly twice as long as the body, the *stem* is flattened on the inner side, rounded on the outer; the internal dorsal angle is produced into a thin membrane, which becomes wider distally. The *club* (figs. 4, 5) is elongated and but slightly expanded, it is covered for three-quarters, and near the tip over almost the whole, of its circumference with exceedingly minute suckers, which give it a velvety appearance even under a lens. The *suckers* are goblet-shaped, with a minute aperture leading into the infundibulum and a bell-shaped horny ring, the base of which is directed towards the peduncle (figs. 6–8).

The Surface is smooth all over.

The Colour is a pale yellowish-grey mottled with dull purple, the spots being more distinct on the ventral surface of the body, fins, and arms. There are four or five oval patches on the outer side of the tentacle near the club.

The Gladius is absent.

Dimensions.

Length, total,	120 mm.
End of body to mantle-margin,	40 „
End of body to eye,	45 „
Breadth of body,	28 „
Breadth of head,	25 „
Eye to edge of umbrella,	15 „
Length of fin,	22 „
Breadth of each fin,	15 „
Breadth across the fins,	57 „

	Right.	Left.
Length of first arm,	38 mm.	35 mm.
Length of second arm,	50 „	50 „
Length of third arm,	50 „	50 „
Length of fourth arm,	38 „	40 „
Length of tentacle,	65 „	70 „
Length of tentacular club,	15 „	15 „

I have thought it well to give a full description and figures of this form because its identity with that described by Dr. Pfeffer is not quite certain. The diagnosis of the latter agrees with the Challenger specimens in every particular, but no mention is made of the remarkable structure of the tentacular suckers; Dr. Pfeffer, to whom I wrote on this matter, does not seem, however, to have made a microscopic examination of them, without which their peculiarities would be quite unnoticed. Having several specimens at my disposal, I removed a piece of the integument with the suckers attached and mounted it in Canada balsam, and from this preparation the figures 6, 7, and 8 on Pl. XIV. were drawn. I am inclined on the whole to think that the species are identical, and Dr. Pfeffer's name was therefore at first applied to the Challenger specimens, and printed at the foot of the plate.

In the absence of males there seems to be no point separating the present form from Verrill's *Inioteuthis*,[1] also from Japan; indeed, so far as females are concerned, this genus would seem to differ only from *Sepiola* in the absence of the gladius, and should perhaps contain several species which have been referred to the latter. Verrill does not say how he identified his type with *Sepiola japonica*, Tilesius, which I have always regarded as one of those Cephalopods concerning which no certain information was to be had; and his description omits the most characteristic point in that of d'Orbigny,[2] namely, the "tendon," which forms an elevated rounded tubular muscle lying between

[1] *Trans. Connect. Acad.*, vol. v. p. 417.

[2] Moll. viv., p. 251.

the two rows of suckers. It would be interesting to know what is the structure of the tentacular suckers in this form.

The original description of *Inioteuthis morsei* (*loc. cit.*) is very brief, and would fit *Sepiola bursa* very well, except that it is not mentioned that the proximal suckers are in two series. The uncertainty at present existing among these various species can only be cleared up by their respective authors giving full particulars regarding the points alluded to above.[1]

Sepiola stenodactyla, Grant,[2] recalls this species by the description of its tentacular clubs, which "present a villous appearance but have no suckers developed;" judging by the figures, however, it has a shorter, more rounded body and longer arms, and the eight series of suckers would be quite diagnostic if this character could be relied upon. This is very doubtful, however, because the description speaks of seven or eight rows very irregularly placed, and because no *Sepiola* has yet been found with other than four distinctly marked series of suckers.

The extreme contraction of the mouth of the horny ring in the tentacular suckers is a point of great interest, especially when taken in connection with the absence of any roughnesses or papillæ on the suctorial surface. It seems to indicate that they adhere by almost pure suction in contradistinction to those of most Decapods, which adhere by a combination of suction with the action of the toothed margin of the ring and the horny papillæ surrounding it.[3]

Rossia, Owen.

Rossia oweni, Ball (Pl. XV. figs. 1–9).

1842. *Rossia Owenii* et *Rossia Jacobii*, Ball, Proc. Roy. Irish Acad., vol. ii. p. 193.
1842. „ „ „ „ Ball, Ann. and Mag. Nat. Hist., vol. ix. p. 349.
1844. *Rossia Oweni* et *Rossia Jacobi*, Thompson, Rep. Brit. Assoc., p. 248.
1845. *Rossia Owenii* et *Rossia Jacobii*, d'Orbigny, Moll. viv. et foss., p. 259.
1845. „ „ Lovén, Öfversigt k. Vetensk. Akad. Förhandl., p. 121.
1849. „ „ Gray, B. M. C., p. 90.
1853. „ „ Forbes and Hanley, Brit. Moll., vol. iv. p. 223, pl. sss, fig. 1.

Habitat.—Off the Butt of Lewis, H.M.S. "Triton," August 25, 1882; 40 fathoms. Three specimens, ♀.

The Minch, H.M.S. "Porcupine," 1869. One specimen, ♀.

Off Wexford, H.M.S. "Porcupine," 1869. One specimen, ♂.

[1] Since these remarks were in type, I have received Appellöf's interesting Memoir on Japanese Cephalopoda, and his description has left no doubt in my mind that the Challenger specimens are of the same species as those which he has named *Inioteuthis morsei*, Verrill; I have, therefore, at the moment of going to press adopted that name in the text of this Report. The absence of males in the collection is greatly to be regretted, as a comparison of the peculiar hecto-cotylised arm would have rendered the identification still more satisfactory.

[2] *Trans. Zool. Soc. Lond.*, vol. i. p. 84, pl. ii. figs. 1, 2.

[3] Niemiec, *Recueil zoöl. suisse*, t. ii. p. 90.

Off Dublin Bay (Ball); Isle of Wight (Forbes and Hanley); Firth of Clyde (Scottish Marine Station); Kattegat (Copenhagen Museum); "ad oras Bohusiæ" (Lovén).

"Rossia Owenii Ball? Ann. nat. hist. IX, 349; pinnis pone medium sitis, brachiis basi discretis, acetabulorum inæqualium serie tri-quadruplici armatis, tentaculis validis, membrana apicali ad basin tori incipiente.—Abdomen ventricosum, satis obtusum, latit. ad longit. = 28:38. Pinnæ ad basin longitudine abdominis dimidium prope æquantes, late ellipticæ, antice per breve spatium limbi liberæ. Caput magnum. Brachia valida, 1, 4, 2, 3, ad basin brevissime colligata, exceptis 3tiis, quæ ad $\frac{1}{6}$ longit. 4tis adnexa, his invicem profunde discretis. Acetabula, quorum in brachii singuli serie laterali circ. 30, inde ab ima basi numeranda, inferius per paria disposita subalterna, deinde per series obliquas tri- et quadruplices, brevissime pedunculata (nec longe, cfr. l. c.), in brach 1:is subæqualia, mediocria, in 4:is, 2:is, et præsertim 3:iis inæqualia, lateralibus media duplo superantibus. Brachia 1 latere externo plica cutis marginali. Tentacula valida, compressa, corpus longitudine æquantia, apice dilatata, revoluta, et intus toro prædita lanceolato, membrana utrinque defenso, ex acetabulis confertis, versus apicem sensim diminutis, superioribus baseos longe maximis, basalia brachii 1:mi vix credentibus; membrana marginalis ad basin tori incipiens. Palpebra crassa, inferior oculum omnino obtegens. Long. tot. = 85 mm.; ad basin brach. 1 = 58 mm.; latit. max. = 28 mm.; long. gladii 23 mm.—Ad oras Bohusiæ hieme semel capta."—(Lovén, *loc. cit.*).

There can be little doubt that as Steenstrup has suggested,[1] the two forms described by Ball are of different sexes and not of different species, although it is not true as stated by Jeffreys[2] that he "considers *R. Owenii* of Ball the male, and his *R. Jacobii* the female of *R. macrosoma*." The distinguishing characters indicated by Ball are exactly those which mark out the sexes; the males have enlarged suckers in the two outer series on the lateral arms, while the females have smaller equal suckers, and the body is more elongated, or, what is the same thing, the arms are "proportionably shorter." The description of the membrane round the mouth given in connection with *Rossia jacobii* is not of the nature of a specific character, being found in many, if not most, genera of Decapoda.

This species is very closely related to several others, many of the distinctive characters being only of a relative nature, as indeed is the case throughout the genus. It differs from *Rossia palpebrosa*, Owen, in the greater equality of the arms and the more posterior position of the fins; it resembles *Rossia hyatti*, Verrill, very closely in many respects (form of body, proportionate length of arms and umbrella, and number of rows of suckers), but the fin is different in shape, wider, and less incised anteriorly, and there are no papillæ on the dorsal surface.

This species is certainly very closely allied to *Rossia macrosoma*, and should

[1] Hectocotyl., p. 199. [2] Brit. Conch., vol. v. p. 134.

perhaps be regarded as only a variety of it; still it seems quite easy to distinguish well-grown specimens of the two species from each other, as follows :—

Rossia oweni.	*Rossia macrosoma.*
1. Attains rather greater dimensions, in the largest specimen in my collection (♀) the length of the body is 50 mm.	1. In the largest specimens I have seen the length of the body was from 30 to 35 mm.
2. The body is more elongated, the breadth being 55 to 65 per cent. of the length.	2. The breadth is 70 to 75 per cent. of the length.
3. The tentacles are shorter.	3. The tentacles are longer.
4. The tentacular suckers are slightly larger.	4. The tentacular suckers are not quite so large.

The most accurate of the descriptions published is that of Lovén quoted above, the original diagnosis of Ball being extremely incomplete and misleading in the statement that the suckers are in three rows; they are really in four, but sometimes (especially in the males) so irregular that on casual inspection only three seem to be present.

The only figure of this species hitherto published is that of Forbes and Hanley (*loc. cit.*) which leaves much to be desired; the tentacular club in particular is very inaccurate (compare Pl. XV. fig. 6 with pl. sss.). The central figure of Pl. XV. is taken from a fine specimen (♀) obtained by H.M.S. "Porcupine," while figures 2 and 5 are from a male captured off Wexford, the only specimen of that sex which has come into my hands. The teeth of the large tentacular suckers are very irregular (see figs. 7 and 9); the papillary area which immediately surrounds the horny ring consists of two rows of obliquely truncated conical papillæ (seen in profile in fig. 8), outside which is a layer of chitinous material with somewhat irregular closely set radial markings.

This species would seem, judging from the literature of the subject, to be rather rare, each of the previous observers having recorded only one specimen, but several unrecorded examples are in the Museums of Copenhagen and Gotheborg, and there can be little doubt that it would have been much more frequently mentioned had it not been wrongly identified with *Rossia macrosoma*. A considerable number of specimens were trawled last summer by the "Medusa" during the sojourn of the Scottish Marine Station at Millport in the Firth of Clyde.

Rossia glaucopis, Lovén.

1845. *Rossia glaucopis*, Lovén, Öfversigt k. Vetensk. Akad. Förhhandl., p. 121.
1869. *Rossia papillifera*, Jeffreys, Brit. Conch., vol. v. p. 134.
1878. *Rossia glaucopis*, Sars, Moll. Reg. Arct. Norv., p. 337, pl. xxxii.

Habitat.—Station 65, north west of the Shetland Islands, cruise of H.M.S. "Porcupine," 1869; lat. 61° 21′ N., long. 3° 44′ W.; 345 fathoms. One immature specimen.

Near Hammerfest, 40 to 50 fathoms (Lovén); north of the Shetlands, 60 to 100 fathoms (Jeffreys); Lofoten and Finmark, not very uncommon at depths of 60 to 200 fathoms (Sars).

An example from the Shetlands enables me to corroborate in the most satisfactory manner the opinion expressed by Professor Sars that *Rossia papillifera* is a synonym of *Rossia glaucopis*. It was contained in a bottle sent to me among the "Porcupine" collection, and had been labelled with the former designation by Jeffreys, while on a separate label it bore the name *Rossia glaucopis*, in the handwriting of Professor Steenstrup, who had examined it along with the remainder of the collection. Professor Steenstrup tells me, moreover, that, from the notes he received along with the "Porcupine" specimens from Jeffreys, he has every reason to believe that this particular individual was the type of *Rossia papillifera*.

I have also compared it myself with specimens of Lovén's species from Lofoten sent to Sir Wyville Thomson by Professor Sars and can find absolutely no points of specific distinction between them.

Rossia sublevis (*?*), Verrill.

1878. *Rossia sublevis*, Vll., Amer. Journ. Sci. and Arts, vol. xvi. p. 209.
1879. „ „ Tryon, Man. Conch., vol. i. p. 160.
1880. „ „ Vll., Amer. Journ. Sci. and Arts, vol. xix. p. 291, pl. xv. fig. 3.
1881. „ „ Vll., Bull. Mus. Comp. Zoöl., vol. viii. p. 104, pl. iii. figs. 2–4, pl. vii. fig. 4.
1881. „ „ Vll., Ceph. N. E. Amer., pp. 354, 419, pl. xxx. fig. 2, pl. xxxi. fig. 3, pl. xlvi. fig. 4, pl. xlvii. figs. 2–4.

Habitat.—Station 313, off Cape Virgins, South America, January 20, 1876; lat. 52° 20′ S., long. 67° 39′ W.; depth, 55 fathoms; sand. One small somewhat damaged specimen, ♀.

Eastern coast of the United States, from Nova Scotia as far south as lat. 32° 33′ 15″ N.; depth, 42 to 640 fathoms (Verrill).

A large number of specimens of *Rossia patagonica*, E. A. Smith, were obtained from the same Station, and it is quite possible that the present may be only a young form of that species; it differs, however, in the shorter and more rounded form of its body, in the longer and narrower pit at the base of the siphon for articulation with the mantle, and in the more elongated tentacular club, and on the whole seems to present greater resemblance to Verrill's species, to which I have, not without hesitation, referred it. If the identification be correct its occurrence so far south is a matter of some interest.

Rossia (*?*) *tenera* (Verrill), mihi.

1880. *Heteroteuthis tenera*, Vll., Amer. Journ. Sci. and Arts, vol. xx. p. 392.
1880. „ „ Vll., Proc. Nat. Hist. Mus., vol. iii. p. 360.
1881. „ „ Vll., "Blake" Rep., vol. viii. p. 103, pl. iii. fig. 5; pl. vii., figs. 2, 3.
1881. „ „ Vll., Ceph. N. E. Amer., p. 357, pl. xlvi. figs. 2, 3; pl. xlvii. fig. 5.
1883. „ „ Vll., "Blake" Suppl., p. 111.

Habitat.—Station 49, south of Halifax, Nova Scotia, May 20, 1873; lat. 43° 3′ N., long. 63° 39′ W.; 85 fathoms; gravel, stones. One specimen, ♀.

Off the New England Coast, 18 to 301 fathoms; off St. Kitts (Verrill).

A small specimen dredged south of Halifax agrees so well with Professor Verrill's *Heteroteuthis tenera* that there can be little doubt as to its correct reference to that species. The differences noticed are, the greater shortness of the ventral arms, which are subequal to the dorsal and shorter than the lateral, whilst on the tentacular club the disparity between the sizes of the suckers is not so marked as in Verrill's figure (pl. xlvi. fig. 2*a*), and the suckers are more numerous, especially towards the proximal end of the club.

Having only a single small specimen at my disposal I did not remove the pen nor the buccal organs.

I cannot, however, agree with Verrill in referring this form to *Heteroteuthis*, Gray, because the type of that genus (*Rossia dispar*, Rüppell), is a very different animal. Among its points of distinction may be mentioned the following:—

1. The fins are placed very far back, projecting beyond the hinder end of the body, as in Verany's figures.[1]

2. The anterior border of the mantle is of quite a different shape, being transverse dorsally, coming forward on either side below the eye and having a notch for the reception of the funnel.

3. The length of the gladius is only one-sixth of the length of the body,[2] while in *Rossia tenera* it is nearly half as long.[3]

4. The enormously large suckers are three or four in number and are situated on the third pair of arms.[4]

5. The dorsal and dorso-lateral arms are united for half their length by a web, and at their conjoined bases on the right side is situated the gland first described by Troschel.[5]

These points I have been able to substantiate by the examination of two male

[1] Céph. médit., pl. xxiii. figs. *d*, *e*, *f*.
[2] Stp., Sepiadarium og Idiosepius, p. 217.
[3] Compare Ceph. N. E. Amer., pl. xlvi. figs. 2 and 2*b*.
[4] Troschel, *Archiv f. Naturgesch.*, Jahrg. xxiii. Bd. i. p. 63; Claus, *op. cit.*, Jahrg. xxiv. Bd. i. p. 259.
[5] *Loc. cit.* Troschel also points out and rectifies Vérany's erroneous statement that it is the females and not the males which are provided with large suckers.

specimens, presented to the British Museum by Rüppell and recorded by Gray in his Catalogue;[1] they leave no doubt that Verrill's *Heteroteuthis* is not that of Gray, and indeed the form described by him does not seem to me to differ so much from other species of *Rossia* as to demand the erection of a new genus for its reception.

Rossia patagonica, E. A. Smith (Pl. XV. figs. 10–18).

1881. *Rossia patagonica*, E. A. Smith, Proc. Zool. Soc. Lond., p. 22, pl. iii. fig. 3.

Habitat.—Station 313, off Cape Virgins, South America, January 20, 1876; lat. 52° 20′ S., long. 67° 39′ W.; 55 fathoms; sand. Twenty-six specimens, 11 ♂, 15 ♀.

Southern Patagonia, 10 and 30 fathoms (E. A. Smith).

Dimensions.[2]

Length, total,	59 mm.
End of body to mantle-margin,	22 „
End of body to eye,	27 „
Breadth of body,	17 „
Breadth of head,	19 „
Eye to edge of umbrella,	8 „
Length of fin,	19 „
Breadth of fin,	9 „
Breadth across both fins,	34 „
Diameter of largest sucker on sessile arm,	2 „
Diameter of largest sucker on tentacle,	0·5 „

	Right.	Left.
Length of first arm,	22 mm.	22 mm.
Length of second arm,	27 „	27 „
Length of third arm,	27 „	28 „
Length of fourth arm,	21 „	21 „
Length of tentacle,	32 „	32 „

The following notes may be given as supplementary to Mr. E. A. Smith's description.

All the arms in both sexes have two series of suckers, except at the extreme tip, where there are four series of very minute ones. The male has the suckers (figs. 14, 18) on the lateral and ventral arms, enlarging rapidly to the middle of the arms and then diminishing (figs. 10–12) their size being three times as great as in the females. The left dorsal arm (fig. 13) is hectocotylised; it has two series of suckers except at the extreme tip, where there are four as usual, and in the middle of the arm the two series assume a zigzag arrangement so as to present the appearance of four. The suckers are

[1] B. M. C., p. 90.

[2] Taken from the largest specimen, a male; the lengths of the arms are measured from the centre of the eye.

mounted upon long conical peduncles, whose bases are curved outwards, and a broad membrane passes up the lateral aspect of the arm for about three quarters of its length.

The tentacular suckers (figs, 16, 17) are largest at the inner border of the club, and there they are bounded by a narrow protective membrane, beyond which is a fin about one-third as broad as the club.

Promachoteuthis,[1] Hoyle.

Body short, rounded, with large broad *fins*, situated posteriorly. *Mantle* free behind, as in *Rossia*; *siphon* short, slender, and with everted margin; valve?

Head small and narrow; *eyes* not prominent.

Arms long and conical, with two series of pedunculate spherical *suckers*. *Tentacles* exactly resembling the arms at their origin; their extremities wanting in the only specimen.

Gladius not removed from the single example.

The definition of this new genus must be regarded as provisional; the only known species being represented by a single specimen, in describing which all that is known about the genus will be stated.

Promachoteuthis megaptera, Hoyle (Pl. XIV. figs. 10–14; woodcut 3).

1885. *Promachoteuthis megaptera*, Hoyle, Narr. Chall. Exp., vol. i. p. 273, fig. 109.
1885. „ „ Hoyle, Diagnoses II., p. 182.
1885. „ „ Hoyle, Prelim. Rep. II., p. 284.

Habitat.—Station 237, south-east of Nosima, Japan, June 17, 1875; lat. 34° 37′ N., long. 140° 32′ E.; 1875 fathoms; blue mud. One mutilated specimen, sex?

The Body is short, barrel-shaped, rounded behind; the *fin* is large, transversely elliptical, and extending beyond the end of the body posteriorly; each half is wider than long. The *mantle-margin* is transversely truncated. The *mantle-connective* consists of a linear ridge on either side, fitting into an almond-shaped depression at each side of the base of the *siphon* (fig. 11), which is short, slender, and has the distal margin everted, like the neck of a flask; the specimen was so small and indifferently preserved that the siphon was not opened to ascertain whether a valve was present.

The Head is very small and narrow, almost the whole of its sides being occupied by the *eyes*, which are not prominent, but are covered with a transparent membrane, and have a distinct pore at a point in front of and below each (fig. 10).

[1] In forming this name I have ventured to make use of Dr. Carpenter's very apt rendering of "Challenger" by πρόμαχος (Narr. Chall. Exp., p. 311).

The Arms are unequal, the fourth pair being the shortest (considerably so on the right side); the first, second, and third are subequal; they are on an average of about the same length as the body, smoothly conical, and taper evenly to fine points. The *suckers* (fig. 14) are in two series throughout, pedunculate, spherical, with a lateral aperture directed inwards (figs. 11, 12); the *horny ring* is smooth and surrounded by a few large papillæ. The *hectocotylus* is not developed. There is no trace of an *umbrella*. The *buccal membrane* is well developed and has the usual seven points, but they are not very well marked nor provided with suckers; the membrane is not connected with the arms by ligaments. There seems to be only one *lip*, which is thick and papillate (fig. 13).

Fig. 3.—*Promachoteuthis megaptera*, Hoyle; natural size.

The Tentacles arise directly between the third and fourth arms, exactly resembling them at their origin, and being obviously serially homologous with them (figs. 10, 13); the *stem* is swollen at first and somewhat more than one third up the arms narrows rather suddenly to about half its previous diameter. The *club* is wanting in the unique specimen.

The Surface is smooth.

The Colour is a dull purplish madder, paler on the fins (especially their under surface) and on the arms and tentacles.

The Gladius has not been extracted.

Dimensions.

Length, total (to end of mutilated tentacle),	50 mm.
End of body to mantle-margin,	15 „
End of body to eye,	18 „
Breadth of body,	9 „
Breadth of head,	6 „
Length of fin,	11 „
Breadth across both fins,	23 „
Diameter of largest sucker on sessile arm,	0·75 „

	Right.	Left.
Length of first arm,	13 mm.	14 mm.
Length of second arm,	14·5 „	15 „
Length of third arm,	14 „	14 „
Length of fourth arm,	7 „	12 „
Length of tentacle (mutilated),	22 „	25 „
Number of suckers on first arm,	37	37
Number of suckers on second arm,	39	39
Number of suckers on third arm,	35	39
Number of suckers on fourth arm,	20	31

The single specimen upon which the genus and species under discussion are based was in a most unsatisfactory condition; the head was separated from the body and the latter was completely gutted, only the integuments remaining. Under these circumstances its relationships to other forms can only be incompletely made out. It seems, however, to be connected in some way or other with all the principal groups of Myopsida.

With *Sepiola* and *Rossia* it agrees in the form of the body and fins (although these are situated much farther back, and even extend beyond the posterior extremity of the body) as also in the spherical form of the suckers. It resembles the latter genus in that the mantle fold seems to have been continuous across the dorsum.

From both these genera it differs in the small size of the head, which is considerably less in diameter than the body, and also in the covering of the eye, the integument passing directly over this without any reduplication to form a lower eyelid; in the last point it resembles *Loligos* as also in the presence of the pre-ocular pore, but whether it also agrees with that genus in the presence of an auricular crest cannot now be determined. A relationship to *Sepia* is indicated by the form of the mantle-connective, which consists of an almond-shaped depression at the hinder angle of the siphon, and not of an elongated groove, as in the other genera just mentioned.

Finally, the similarity between the tentacles and the arms, alluded to above, may perhaps be a primitive character; it has also been observed in *Taonius suhmi* (see p. 192).

Family VIII. Sepiarii, Steenstrup.

Subfamily Idiosepii, Steenstrup.

Spirula, Lamarck.

Spirula peronii, Lamarck.

1822. *Spirula peronii*, Lmk., Anim. s. Vert., t. vii. p. 601.

Habitat.—Station 194A, off Banda, September 29, 1874; lat. 4° 31′ S., long. 129° 57′ 20″ E.; 360 fathoms; volcanic mud. One specimen, with soft parts.

North Atlantic, April 29, 1876, surface. Dead shells.

Raine Island, Torres Strait. Dead shells from the shore.

Station 216A, north of Papua, February 16, 1875; lat. 2° 56′ N., long. 134° 11′ E.; 2000 fathoms; Globigerina ooze. One dead shell with a Cirriped attached (almost certainly from the surface).

February 22, 1875; 70 miles north-east of Fort D'Urville, Papua. Dead shell.

Since Professor Huxley is preparing a Report on this genus, I have merely recorded the localities at which its occurrence was observed during the Expedition.

Subfamily Eusepii, Steenstrup.

Sepia, Linné.

One of the most marked accessions of new species has been to this already large genus, which has been augmented to the extent of no less than ten new types as the result of the Challenger Expedition. It is noteworthy, moreover, that all these were obtained between Port Jackson, Australia, and Japan, a fact which will be again alluded to when treating of distribution (see p. 222).

The species of this genus being very numerous and differing only in minute, though to all appearance constant characters, it has been necessary to enter into considerable detail in their descriptions, and the more so, inasmuch as the accounts of nearly all the earlier writers have left much to be desired in this respect. This is the case especially with respect to the shell or sepiostaire, regarding the different parts of which no settled terminology seems to have been adopted, even by those writers who have most clearly recognised its systematic importance. I have therefore found it necessary to adopt a series of names for descriptive purposes, and have endeavoured to select those which should be convenient, readily suggestive of the structures to which they refer, and devoid of any abstract morphological significance with regard to their origin or homology. The annexed woodcut shows the names chosen, with respect to one or two of which it may be advisable to make some observations.

The *last loculus* is a term borrowed from d'Orbigny, who adopted it for the most recently deposited calcareous layer; the proportion which it bears to the area of the shell is very characteristic, and appears to be constant within certain limits. Professor Steenstrup informs me that it varies according to the season of the year. This relation is for practical purposes most conveniently expressed by dividing the total length of the shell into one hundred parts, and stating how many of them are occupied by it; this quantity I propose to designate briefly as the "locular index."

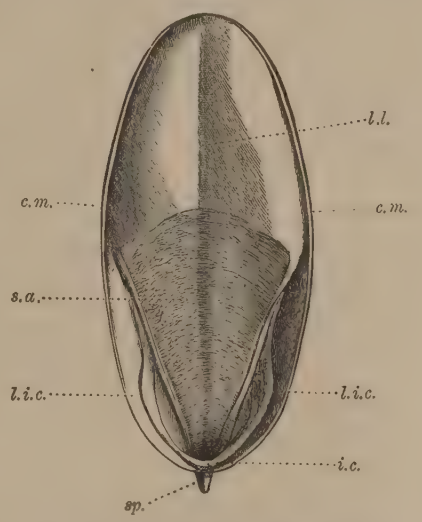

Fig. 4.—Shell of *Sepia mestus*, Gray, showing the terms used in describing different parts of it. *c.m.*, chitinous margin; *i.c.*, inner cone; *l.i.c.*, limbs of the inner cone; *l.l.*, last loculus; *s.a.*, striated area; *sp.*, spine.

The hinder generally hollow ventral surface of the shell I have called the "striated area"; valuable characters are derived from the curvature of the parallel lines formed by the margins of the loculi.

In most shells a thin fillet of calcareous matter runs along either side of this area,

and posteriorly these two fillets unite and often form a little pointed space into which the hinder end of the visceral sac is received; this I have called the "inner cone," because in many cases the margin of the shell proper forms a larger more or less complete cone outside this, which is called the "outer cone." (See Pl. XXI. figs. 14, 15.) The two fillets above described will be alluded to as the "limbs of the inner cone."

The suckers, also, in this genus offer valuable characters for the discrimination of species; they are always pedunculate and obliquely set, as in most Decapoda, but the horny ring surrounding the acetabular cavity may be either smooth or more or less coarsely toothed. Steenstrup has pointed out that this denticulation is in some cases subject to a sexual variation, so that in instituting comparisons between different forms in respect of this character, care must be taken not to use different sexes. The ring is commonly surrounded by an area in which the epidermal cells are surmounted by rough plates of a chitinous material; this I propose to call the "papillary area." The relative sizes and shapes of its component parts vary in different species, and in many cases I have figured them. Furthermore, the margin of the sucker itself is in many species marked by a number of narrow grooves, separating more bulging intermediate portions; these, from their direction, will be called "meridional grooves," and will be alluded to in those cases in which their presence has been observed.

The structure of the hectocotylised arm has been described and figured, wherever it was present; and so far from this being uniform throughout the genus, no less than four different types of modification have been observed. It is very unfortunate that we have accurate information on this point in so few forms of this genus, for there is no doubt that it would afford a most valuable character in the discrimination of species.

I regret that I have been unable in the present work to adopt the divisions of the genus proposed by Dr. de Rochebrune in his recent "Étude monographique;"[1] from some of his conclusions I am obliged to differ entirely, as for example the separation of *Diphtherosepion ornatum* (Rang), from the genus *Sepiella*, and having been unable to go fully into the whole question it appeared to me better to leave the genus intact, except in so far as specimens, which I have myself examined, seemed to require a different treatment.

Sepia smithi,[1] Hoyle (Pl. XVI. figs. 1–12).

1885. *Sepia Smithi*, Hoyle, Diagnoses I., p. 190.
1885. „ „ Hoyle, Prelim. Rep. I., p. 294.

Habitat.—Station 188, Arafura Sea, south of Papua, September 10, 1874; lat. 9° 59′ S., long. 139° 42′ E.; 28 fathoms; green mud. Four specimens, ♀.

[1] *Bull. Soc. Philom. Paris*, sér. 7, t. viii. pp. 74–122, pls. iii.–vi.

[2] Named after Mr. Edgar A. Smith, F.Z.S., of the British Museum, whose investigation of the collections made by H.M.S. "Alert," has made us acquainted with several new and interesting Cephalopods.

The Body is of medium breadth, widest one-third back, curving evenly to a pointed posterior extremity. The *fin* is nearly one-third the breadth of the body, extending from the anterior margin of the mantle to within 4 mm. of its fellow at the posterior extremity. The *mantle-margin* projects to a considerable extent over the head dorsally, and is slightly emarginate ventrally. The *siphon* is long, reaching up to the interspace between the ventral arms.

The Head is of medium breadth and the *eyes* prominent.

The Arms are subequal, their order of length being 4, 3, 2, 1; they are a little more than half as long as the body; the dorsal are the smallest and subconical, the ventral wide and with a narrow web on the outer aspect; they all taper gradually to fine points. The *suckers* (figs. 6, 7) are in four series throughout, pedunculate, oblique, notched proximally and distally, and with meridional grooves on the margin; the *horny ring* has about twenty blunt triangular teeth on the distal semi-circumference, and is surrounded by a broad papillary area (fig. 7). The *hectocotylus* was not observed, all the specimens being females. The *umbrella* is but slightly developed, reaching in its greatest extent (between the third and fourth arms) only to the fourth row of suckers. The *buccal membrane* has the usual seven points, but there is no *spermatic pad*. The *outer lip* is moderately thick and longitudinally ribbed; the *inner* is provided with many rows of elevated rounded papillæ.

The Tentacles are about as long as the mantle, and have stout three-sided *stems;* the *club* occupies about one-fourth of the whole length, and extends fully half round the stem (fig, 3); a protective membrane is found at either side of the suckers and a web along the dorso-median aspect of the club (fig. 4). The *suckers* are very numerous, minute, and closely packed; the *horny ring* has about eight or ten stout distant teeth on the distal margin (fig. 8).

The Surface is for the most part smooth, but there are about five elongated elevations down each side of the body near the origin of the fin, and a few minute papillæ on the dorsal surface.

The Colour is a dull purplish-grey above, pale ochre below.

The Shell is roughly elliptical in *outline* (figs. 10, 11, 12); the anterior extremity is bounded by two nearly straight lines forming a blunt rounded angle; the sides curve evenly outwards (the greatest breadth being a little anterior to the middle) and form a bluntish point behind. The *chitinous margin* is narrow and vanishes in the median ventral line behind. The *dorsal surface* is rough, with granules arranged in rows parallel to the anterior margin; three slightly elevated tracts diverge from the spine to the three anterior angles (fig. 12). The *ventral surface* is little elevated; the *last loculus* has an index of 29·5, and is emarginate behind, being bounded by a more or less evenly curved line; the *striated area* is excavated, so that the whole shell is thin; the *inner cone* is well developed, with a thickened rounded margin, and encloses a deep

pit; the limbs extend halfway along the striated area. The *spine* is long, tapering, and curves gently upwards.

Dimensions.

Length, total,	119 mm.
End of body to mantle-margin,	70 „
End of body to eye,	70 „
Breadth of body,	35 „
Breadth of head,	30 „
Eye to edge of umbrella,	20 „
Breadth of fin,	10 „
Diameter of largest sucker on sessile arm,	1 „
Length of shell,[1]	84 „
Breadth of shell,[1]	30 „

	Right.	Left.
Length of first arm,[2]	24 mm.	24 mm.
Length of second arm,	25 „	25 „
Length of third arm,	26 „	26 „
Length of fourth arm,	32 „	32 „
Length of tentacle,	...	72 „
Length of tentacular club,	...	18 „

The shell of this species somewhat resembles that of *Sepia aculeata*, but the animal has no suckers on the buccal membrane; it is also like d'Orbigny's figure of *Sepia indica*, but it has a shallower groove along the middle of the ventral surface, and the striations are less wavy than his description would appear to indicate; in addition to which the teeth on the suckers of the sessile arms are different.[3]

The body of one specimen had a lank, lean appearance as compared with the others, suggesting the idea that it might be a male; on examination, however, it proved to be a female which had recently deposited its eggs.

Sepia papuensis, Hoyle (Pl. XVI. figs. 13–23).

1885. *Sepia papuensis*, Hoyle, Diagnoses II., p. 197.
1885. „ „ Hoyle, Prelim. Rep. II., p. 301.

Habitat.—Station 188, in the Arafura Sea, south of Papua, September 10; 1874; lat. 9° 59′ S., long. 139° 42′ E; 28 fathoms; green mud. Two specimens, ♀.

The Body is elongated, broadest about one-third back, pointed behind: the *fins* extend the whole length of the body and are one-third of its breadth, a little wider

[1] From a larger specimen.
[2] Measured from the margin of the mouth.
[3] It is proper to mention here that, as Steenstrup has already pointed out, a confusion apparently inexplicable exists between d'Orbigny's species, *Sepia rostrata* and *Sepia indica;* the descriptions given by him disagree in many points with the figures on his plates, and there is no evidence to show whether plates or text should be accepted as the ultimate criterion; Dr. de Rochebrune in his recent Memoir has not touched upon these discrepancies.

behind; they extend to within 1 mm. of the anterior margin, but are separated by about 5 mm. posteriorly: the *mantle-margin* projects far over the head dorsally, and is slightly emarginate ventrally. The *siphon* is conical, reaching two-thirds up to the gap between the ventral arms.

The Head is short and broad; the *eyes* prominent.

The Arms are subequal, their order of length being 4, 3, 1, 2; they are about one-fourth as long as the body and taper to fine points: the dorsal are conical with a very slight ridge up the outer aspect, the third pair have a similar ridge; the ventral are flattened and bear a distinct crest. The *suckers* (figs. 19, 20) are in four series throughout and of moderate size, set obliquely on short peduncles, with meridional grooves on the outside: the *horny ring* bears twenty to twenty-five long, square-cut, irregular teeth on its distal semicircumference (fig. 20), and outside it is an area covered with closely set papillæ. The *hectocotylus* was not observed, both the specimens being females. The *umbrella* is slight, reaching only as high as the sixth row of suckers between the third and fourth arms, where it is widest; as usual it is entirely absent between the two ventral arms. The *buccal membrane* has the usual seven points. The *spermatic pad* is not developed; the *outer lip* is smooth, except for a few ridges due to contraction; the *inner* bears numerous small papillæ.

The Tentacles are about as long as the body, the *stem* being three-sided: the *club* is short, flattened, and expanded, with a protective membrane on either side and a broad web down the back, reaching along the stem for a distance equal to half the length of the club (fig. 15); it bears six larger *suckers* in the central row, a series of smaller ones on either side, and some very minute ones along each margin: at the top are fifteen to twenty in four series. The *horny ring* of the large suckers has twenty-five to thirty teeth in its distal semicircle (fig. 18); those of the smaller about ten.

The Surface is smooth, except for a few irregular inconstant papillæ on one side of the ventral surface and below the eye.

The Colour is a pale yellowish-grey, darker above.

The Jaws are shown in figs. 16, 17.

The Shell (figs. 21, 22, 23) is oval in *outline*, broadest anteriorly to the middle, tapering somewhat rapidly and ending in a semicircle in front; posteriorly it tapers gently, and, then rounding off, ends in two almost straight lines, which meet at a right angle at the base of the spine. The *chitinous margin* is but slightly uncovered on the *dorsal surface*, which shows two grooves diverging as they pass forwards, separating three ribs, and is covered with rounded papillæ arranged in curves parallel to the anterior margin. The *ventral surface* has a rather deep and broad median groove: the *last loculus* has an index of 34, and is bounded posteriorly by a wavy line with three curves; the *striated area* is hollowed, so that this part of the shell is thin; the

inner cone commences by two limbs, which arise halfway along the striated area, curve outwards, and are united below the posterior apex by a broad chitinous band passing from one side of the shell to the other and forming a rather deep *outer cone:* the *spine* is short (but has been broken off); it bends slightly upwards and has a narrow longitudinal keel on its ventral surface.

Dimensions.

Length, total,	90 mm.
End of body to mantle-margin,	64 „
End of body to eye,	60 „
Breadth of body,	28 „
Breadth of head,	26 „
Eye to edge of umbrella,	12 „
Breadth of fin,	7 „
Diameter of largest sucker on sessile arm,	0·75 „
Length of shell,	64 „
Breadth of shell,	22 „

	Right.	Left.
Length of first arm,	20 mm.	19 mm.
Length of second arm,	20 „	18 „
Length of third arm,	20 „	21 „
Length of fourth arm,	23 „	22 „
Length of tentacle,	...	50 „

This species agrees very closely with *Sepia singaporensis*, Pfeffer,[1] as regards the soft parts, but the shell is broader at the anterior extremity and the spine cannot be said to be "zurück gebogen," although it slopes gently upwards; it is also near to *Sepia plangon*,[2] Gray, which seems, however, to be still nearer to Dr. Pfeffer's species.

It corresponds with an unnamed shell in the Copenhagen Museum.

The smaller specimen has the curve bounding the loculi even, not wavy, and the keel upon the spine is more distinct than in the other specimen.

[1] Ceph. Hamb. Mus., p. 10, fig. 13.,

[2] *Sepia plangon*, Gray. The type specimen in the British Museum has the following characters:—The *body* is moderately long and oval in form; the *fins* are very narrow but seem to have been partially destroyed; they commence about 2 mm. from the anterior edge of the body, and extend to within 2 mm. of each other behind. The *mantle margin* extends far over the head dorsally, and the *siphon* is short. The *head* is rather narrow. The *arms* are about half the length of the body, their order being 4, 3, 2, 1. The *suckers* are in four series and of medium size; the *horny rings* have fallen out. No *hectocotylus* is present. The *umbrella* extends about one-fifth up the arms; the buccal membrane has the usual arrangement; the *outer lip* is thin, the *inner* thick and papillate. The *tentacles* are about twice the length of the body; the *club* flat and expanded, and the *suckers* apparently in four series. The *surface* is smooth. The *colour* is dark brown. The *shell* resembles that of *Sepia singaporensis*, Pfeffer, more nearly than any other known to me; the only differences being that the incurving of the margins of the loculi in the striated area is a little more pronounced, and there is a ridge or keel on the ventral surface of the spine (as in *Sepia cultrata*) not recorded by Dr. Pfeffer. These two species are much alike, but they differ in the arrangement of the suckers on the tentacular club.

Sepia esculenta, Hoyle (Pl. XVII. figs. 1–5; Pl. XVIII. figs. 1–6).

1885. *Sepia esculenta*, Hoyle, Diagnoses II., p. 188.
1885. „ „ Hoyle, Prelim. Rep. II., p. 291.
1886. „ „ Appellöf, Japanska Ceph., p. 28, pl. iii. figs. 1–6, 24.

Habitat.—Japan, purchased in the market, Yokohama. Two specimens, ♂, ♀. Japan (Appellöf).

The Body is broad, stout, and semielliptical posteriorly. The *fins* are about one-fourth of the body in breadth and commence within 6 mm. of the anterior margin, and end within 5 mm. of each other; the *mantle margin* is produced far over the head dorsally, and evenly truncated below. The *siphon* just reaches the gap between the ventral arms.

The Head is broad, and the *eyes* laterally prominent.

The Arms are subequal, the order of length being 4, 1, 2, 3, and nearly half as long as the body; they are all more or less compressed, especially the ventral ones; they have a distinct web along the outer margin, and a rather broad membrane runs up either side of the sucker-bearing face. The *suckers* are in four series throughout (Pl. XVII. fig. 2), not very obliquely set; they are large and spheroidal, and have meridional markings on the outer surface; the *horny ring* is smooth and surrounded by a narrow papillary area. In the *hectocotylised* arm of the male (Pl. XVIII. fig. 6) the first four rows of suckers are normal, then come two rows of gradually diminishing suckers, succeeded by four rows of minute ones, after which they again regain their normal dimensions. The *umbrella* is narrow, widest between the second and third arms, where it reaches up to the fifth row of suckers. The *buccal membrane* has the usual seven points in the male; in the female the two ventral ones are rounded off; the *spermatic pad* is exceedingly well developed, and has four deep transverse grooves. The *outer lip* is thin and longitudinally corrugated; the *inner* is thick and bears numerous very long papillæ.

The Tentacles are "about as long as or somewhat longer than the body; their *suckers* are small and of equal size, stand in about ten series and are somewhat oblique. The *horny rings* are provided on the distal margin with from twelve to fourteen very long but blunt teeth, which, on the proximal margin pass over into similar shorter ones."[1]

The Surface is smooth throughout.

The Colour is dull grey, mottled with black above, yellowish below.

The Jaws are shown on Pl. XVII. figs. 4, 5.

The Shell (Pl. XVII. fig. 3; Pl. XVIII. figs. 1, 2, 3) is elliptical in *outline*, somewhat broader behind (especially in the female); the *chitinous margin* is narrow and does not form a complete ridge across the shell below the spine; it forms two slightly expanded wings behind, and its uncovered marginal part is narrow; the *dorsal surface* is marked

[1] Appellöf, *loc. cit.* The tentacles had been removed from both the Challenger specimens.

with coarse rugosities disposed in curved lines parallel to the anterior margin; a distinct but low rib runs down the centre. The *ventral surface* is elevated on either side of a deep median groove; the *last loculus* has an index of 22 in the male and 17 in the female specimen, and is bounded posteriorly by two slightly wavy lines, meeting at an acute angle; the *striated area* is long, and the angle between the striæ widens posteriorly. The *inner cone* is very well developed; the *limbs* arise one-fifth the length of the shell from the posterior end, and gradually become more elevated until they enclose a deep conical cavity. The *spine* is strong and pointed (Pl. XVIII. figs. 1, 2), somewhat curved laterally in the female example.

Dimensions.[1]

Length, total,	240 mm.
End of body to mantle-margin, dorsally,	160 „
End of body to mantle-margin, ventrally,	140 „
End of body to eye,	155 „
Breadth of body,	75 „
Breadth of head,	55 „
Eye to edge of umbrella,	40 „
Breadth of fin,	20 „
Diameter of largest sucker on sessile arm,	2·5 „
Length of shell,	163 „
Breadth of shell,	52 „

	Right.	Left.
Length of first arm,	65 mm.	68 mm.
Length of second arm,	65 „	60 „
Length of third arm,	63 „	58 „
Length of fourth arm,	70 „	63 „

This fine species approaches *Sepia aculeata*, van Hasselt, but lacks the suckers on the buccal membrane,[2] and also the callosity of the inner cone at the posterior extremity of the shell. This cannot be due to immaturity, for the two specimens in the Challenger collection are larger than undoubted specimens of *Sepia aculeata*, in which this peculiarity is well marked.

It has moreover some resemblance to *Sepia brevimana*, Steenstrup, but the shell is not so broad in proportion nor so regularly elliptical, being rather more dilated in its posterior half.

Perhaps, however, its closest relationship is with an unpublished form in the Copenhagen Museum, labelled "*Sepiæ rostratæ affinis*," but that the posterior extremity of its shell is more rounded (both being females). The thickened spermatic pad is more fully developed in the Challenger than in the Copenhagen specimen, which may,

[1] The dimensions above are from the male specimen; in the female the length of the body is 143 mm. dorsally and 123 mm. ventrally and the breadth 70 mm., length of shell 143 mm., breadth 54 mm.

[2] Steenstrup, Hemisepius, pl. ii. fig. 4.

however, be owing to the smaller size and presumably less complete development of the latter, which had unfortunately lost the horny rings of its suckers, so that comparison of these parts was impossible.

The two specimens of the present species furnish an admirable illustration of the sexual differences in the genus *Sepia;* the structure of the hectocotylised arm has been described above, but in addition to that it is seen that the proportions of the body are very different; the breadth being 52 per cent. of the length in the male and 57 per cent. in the female. This difference is still more pronounced in the shells, the breadth of the male shell being only 32 per cent. of the length, while in the female it is 37 per cent.

Appellöf has had the good fortune to examine specimens of this species in which the tentacles were present, and I have inserted above a translation of his description of those organs. He adds also some interesting and valuable remarks on the gradual development of teeth in the suckers and on the relations of the species.

Sepia elliptica,[1] Hoyle (Pl. XIX. figs. 14–24).

1885. *Sepia elliptica*, Hoyle, Diagnoses II., p. 189.
1885. „ „ Hoyle, Prelim. Rep. II., p. 293.

Habitat.—Station 188, Arafura Sea, south of Papua, September 10, 1874; lat. 9° 59′ S., long. 139° 42′ E.; 28 fathoms; green mud. Four specimens, one ♂, three ♀.

Station 190, Arafura Sea, south of Papua, September 12, 1874; lat. 8° 56′ S., long. 136° 5′ E.; 49 fathoms; green mud. Four specimens, one ♂, three ♀.

The Body is ovoid, broadest one-third from the anterior margin, pointed behind. The *fins* are one-third the width of the body, broadest in the middle, extending the whole length of the body, and approaching within 2 mm. of each other posteriorly. The *mantle-margin* is not very prominent over the head dorsally. The *mantle-connective* is rather short and deep, but otherwise normal. The *siphon* is conical, reaching to within 1 mm. of, or quite up to the space between the ventral arms.

The Head is very short and broad, the *eyes* prominent.

The Arms are subequal, the order of length being 4, 3, 2, 1, or 4, 2, 3, 1; they are nearly half the length of the body, and taper evenly to fine points; there is a distinct but narrow ridge along the fourth arm, and a delicate web along each side of the oral aspect of the arms. The *suckers* are in four series throughout, and of moderate size, marked with inconstant meridional grooves (fig. 17), and there is a large notch proximally and distally in the rim (fig. 19). The *horny ring* has for the most part no distinct teeth, but is marked in the distal half with shallow irregular notches, which are occasionally more regular (figs. 17, 19). A papillary area surrounds the horny ring (fig. 18). The *hectocotylus* is developed in about the middle third of the left ventral arm (fig. 16); beyond

[1] So named from the form of the shell.

the eighth row of suckers the two ventral series are continued of the normal size, but the two dorsal are each represented by five minute suckers, gradually diminishing to the middle one and then increasing again; beyond this the arm exhibits no peculiarities. The *umbrella* is widest between the two lateral arms, where it extends as far as the sixth row of suckers. The *buccal membrane* bears the usual seven distinct points in the male, whilst in the female the ventral pair are lost in the thick swollen *spermatic pad* (fig. 15), which is subdivided by four or five deep grooves into as many transverse ridges. The *outer lip* is thin; the *inner* bears about half a dozen rows of distinct hemispheroidal papillæ.

The Tentacles are about as long as the mantle; the *stem* is indistinctly three-sided; the *club* is long and wide, and bears eight series of minute equal suckers; there is a *protective membrane* on either side and a broad *fin* on the dorso-internal aspect. The *horny ring* is small and has a smooth margin.

The Surface is smooth.

The Colour is a dull grey dorsally, pale yellowish below.

The Jaws are shown in figs. 20, 21.

The Shell (figs. 22–24) is broad, subelliptical in *outline*, the anterior extremity bounded by two straight lines, which form obtuse rounded-off angles with each other and the sides of the shell; the posterior is rounded gradually off. The *dorsal surface* has a faint ridge passing to each of the three angles just mentioned, and is covered with curved rows of tubercles parallel to the anterior margin. The *ventral surface* is but little elevated; the *last loculus* has an index of 34, and is bounded behind by a broadly open curve with three or four irregular sinuations in it. The *striated area* is hollowed posteriorly and is marked by grooves corresponding to the sinuations just mentioned. The *inner cone* arises about halfway along the striated area, curves evenly outwards, and then rises into a distinct ridge, forming a wall separate from the margin of the shell; its ventral surface is marked by a number of striæ pointing in the direction of the *spine*, which is of medium length and strength, and curved gently upwards.

Dimensions.[1]

Length, total,	102 mm.
End of body to mantle-margin,	72 „
End of body to eye,	66 „
Breadth of body,	40 „
Breadth of head,	33 „
Eye to edge of umbrella,	15 „
Breadth of fin,	11 „
Diameter of largest sucker on sessile arm,	1 „
Length of shell,	72 „
Breadth of shell,	31 „

[1] Taken from one of the female specimens from Station 188.

	Right.	Left.
Length of first arm,[1]	25 mm.	25 mm.
Length of second arm,	27 „	27 „
Length of third arm,	26 „	26 „
Length of fourth arm,	27 „	30 „
Length of tentacle,	...	72 „
Length of tentacular club,	...	12 „

The shell of this species resembles that of *Sepia brevimana*, Steenstrup, but it is not so hollow, and has a series of two or three radial ridges on the middle of the inferior surface of the inner cone (fig. 24), while in the latter species the inner cone has a thickened margin not seen in these specimens. It also resembles that of *Sepia aculeata*, but the inner cone is very much less pronounced, and as regards the animal itself, the tentacular club is much shorter and there are no suckers on the buccal membrane.

In general form the shell bears some likeness to *Sepia rostrata*, but the inner cone is much less developed and the spine very much smaller, while the horny ring of the suckers is not "très petit" nor has it "bords lisses" as stated by d'Orbigny, though here his description does not agree with his figure.[2]

The specimens from Station 190 differ a little from those from Station 188 in that the horny rings of the suckers of the sessile arms are more decidedly toothed, but both forms agree so closely in other characters, that I have not thought it necessary to separate them formally. This fact is an instance of an observation that has frequently been made in regard to other classes of animals, namely, that in those regions where a genus is particularly abundant and rich in species, it presents also the largest number of varieties, whence the species show a greater tendency to run into each other and become more difficult to define. There seems abundant reason to believe, as will be shown in the section of this Report treating of Distribution, that the Indian Archipelago and neighbouring seas are the localities richest in species of *Sepia*.

Sepia cultrata, Steenstrup MS. (Pl. XX.).

...	*Sepia cultrata*,	Stp., MS. in Mus. Havn.
1885.	„	„	Hoyle, Diagnoses II., p. 198.
1885.	„	„	Hoyle, Prelim. Rep. II., p. 303.
var. =	„	*capensis*,	Gray, B. M. C., p. 110 (*excl. syn.*).

Habitat.—Station 163A, off Twofold Bay, Australia, April 4, 1874; lat. 36° 59′ S., long. 150° 20′ E; 150 fathoms; green mud. One specimen, ♀.

The Body is elongated, broadest about the middle of its length. The *fins* are rather narrow, about one-fourth the breadth of the body, commencing 2 mm. from the anterior edge of the body and approaching within 5 mm. of each other posteriorly; the

[1] Measured from the oral margin.

[2] Compare. Céph. acét., pl. xxvi. figs. 7, 8.

left is somewhat broader than the right. The *mantle-margin* extends far over the head dorsally and is not emarginate, but slightly undulating ventrally. The *siphon* is short, terminating far short of the depression between the ventral arms.

The Head is broad, and the *eyes* very prominent.

The Arms are subequal, the order of length being 4, 1, 2, 3; they are one-fourth the length of the body, all are flattened and taper evenly to fine points. The *suckers* are in four series (fig. 4), except in the right dorsal arm, where they appear to be in two, probably owing to its state of extreme compression; they are of medium size, many are deeply notched proximally and distally, and provided with fine meridional grooves on the margin (fig. 6); the *horny ring* is smooth and surrounded by a papillary area. The *hectocotylus* was not seen, the only specimen being a female. The *umbrella* is small, widest between the lateral arms, where it reaches up to the sixth or seventh row of suckers. The *buccal membrane* has five distinct points, the ventral edge being thickened and forming a large folded *spermatic pad* (fig. 3); it bears no suckers. The *outer lip* is thick, and marked with fine longitudinal grooves; the *inner* is papillate.

The Tentacles are as long as the mantle, with a three-sided flattened *stem*, much broader proximally than distally. The *club* is slightly expanded, with a narrow protective membrane below, a broad one above, and a distinct web outwardly (fig. 5). There are five or six series of *suckers*, slightly larger in the middle than at the margins, on very long slender peduncles; the *horny ring* is smooth.

The Surface bears a number of small irregularly scattered papillæ, and four or five elongated warts on the dorsum near the origin of the fins, and some folds in the skin on the ventral surface; probably these are due to contraction.

The Colour is a dull grey with a bluish shade above inclining to yellow below.

The Jaws are shown in figs. 7, 8.

The Shell (figs. 9–11) has an elongate oval *outline*, broadest one-third of the way back and rounded off at both ends. The free *chitinous margin* is narrow anteriorly, then broader, evanescent posteriorly, a deep calcareous *outer cone* forming the posterior extremity of the shell; it is but slightly exposed on the *dorsal surface*, which bears only faint indications of a median ridge, and is beset with fine granules disposed in rows parallel to the anterior margin. The *ventral surface* is elevated so as to give the shell a more than average thickness; the *last loculus* has an index of 33, and is bounded by a tranverse hemielliptical curve; the *striated area* is excavated, but slightly convex in the middle line. The *inner cone* consists only of the slightly elevated limbs, which run along three-quarters of the striated area and unite with each other as a flattened fillet posteriorly. The *spine* has lost its extreme point, but it is strong, and has a raised knife-like ridge developed upon its ventral aspect[1] (fig. 11).

[1] Whence the specific name.

Dimensions.

Length, total,	113 mm.
End of body to mantle-margin,	84 „
End of body to eye,	78 „
Breadth of body,	37 „
Breadth of head,	40 „
Eye to edge of umbrella,	18 „
Breadth of fin,	8 „
Diameter of largest sucker on sessile arm,	1 „
Diameter of largest sucker on tentacle,	0·6 „
Length of shell,	90 „
Breadth of shell,	29 „

	Right.	Left.
Length of first arm,[1]	23 mm.	22 mm.
Length of second arm,	22 „	20 „
Length of third arm,	20 „	20 „
Length of fourth arm,	23 „	22 „
Length of tentacle,	80 „	...

This species is of special interest because it has hitherto been known only from a shell in the Zoological Museum at Copenhagen, which was the only specimen then known to possess the peculiar ridged spine shown in fig. 11. Recently, however, I

FIG. 5.—Shell of *Sepia mestus*, Gray, from the type specimen in the British Museum labelled "Sep. mestus. Australia, Presented by Dr. Sinclair, R.N." Drawn by Mr. P. J. Smit.

happened to notice that the type of Gray's *Sepia mestus* was similarly armed, but being then unable to make a thorough investigation of the matter, I sent the Challenger specimen to my friend Mr. Edgar Smith who was good enough to institute a comparison

[1] The lengths of the arms are measured from the oral margin.

for me between the two shells; he says (as is obvious from the figures), that the Challenger species is different in form from *Sepia mestus*, which is comparatively broader "and has a peculiar raised band on each side not unlike a muscular scar"; and adds "I think your shell may be the same species (although a *var.*) that Gray has identified in the museum collection as *Sepia capensis*, but which seems to me distinct from *Sepia capensis* of d'Orbigny (=*Sepia australis*, Gray and Gaimard). Our two shells, both from Australia (one from Port Jackson), are rather narrower than yours;" further, the last loculus is smaller and the curve of its posterior margin is more flattened. The two shells alluded to by Mr. Smith are here figured for comparison with the Challenger specimen.

The present specimen differs from *Sepia capensis*, d'Orbigny, in the form of the

FIG. 6.—Shell of a *Sepia* in the British Museum labelled "*S. capensis*. Sydney, Presented by J. Edwards, Esq. R.N." Drawn by Mr. P. J. Smit.

ventral aspect of the shell; furthermore, the curves of the striated area are more transverse, the anterior extremity is more pointed, and there is the ridge on the spine not mentioned by d'Orbigny (compare Céph. acét., pl. vii. fig. 4). As regards the external characters of the animal, *Sepia capensis* has three suckers on the tentacle larger than the rest, and on the sessile arms the two inner series of suckers are larger than the outer.

The second left arm shows an abnormality, the groove in which the suckers lie being interrupted for about 2 mm. by the folding over and union of the two margins; the part of the arm beyond this has only two series of very small suckers (fig. 2).

Sepia recurvirostra (*?*), Steenstrup.

1875. *Sepia recurvirostra*, Steenstrup, Hemisepius, pp. 475, 479.

Habitat.—Station 207, off Tablas Island, January 16, 1875; lat. 12° 21′ N., long. 122° 15′ E.; 700 fathoms. One broken shell.

Eastern Archipelago (Copenhagen Museum).

A much mutilated shell was brought up in the trawl at the above locality; unfortunately the posterior extremity, which furnishes the most striking character of Professor Steenstrup's species, was wanting, but still the general form of the body of the shell and the curvature of the lines in the striated area resemble that type more than any other known to me, and as the locality is corroborative of this view I refer it with a query to that species.

Sepia sulcata,[1] Hoyle (Pl. XIX. figs. 1–13).

1885. *Sepia sulcata*, Hoyle, Diagnoses II., p. 192.
1885. „ „ Hoyle, Prelim. Rep. II., p. 296.

Habitat.—Station 192, off the Ki Islands, Arafura Sea, September 26, 1874; lat. 5° 49′ 15″ S., long. 132° 14′ 15″ E.; 140 fathoms; blue mud. One specimen, ♂.

The Body is cylindrical in its anterior fourth, then tapers gradually backwards, and is pointed behind. The *fins* are one-fifth the breadth of the body, commence 2 mm. from the anterior margin of the mantle, and approach within 5 mm. of each other posteriorly; the *mantle-margin* reaches far over the head dorsally, and is evenly truncated below. The *siphon* does not extend up to the interbrachial space.

The Head is broad and the *eyes* very prominent; in the only specimen it is much retracted into the mantle.

The Arms are subequal, the order of length being 4, 3, 2, 1; they are one-third the length of the mantle, and taper gradually to slender points; the first are thin and rounded, the fourth flattened, each has a distinct ridge on the outer side, which in the fourth expands to a broad membrane. The *suckers* are in two series in the first and second arms, but with a tendency to form four series in the others, more especially in the distal portions; they are pedunculate and very oblique (fig. 7), and the margin is marked with meridional grooves and has a deep distal notch; the *horny ring* is small, smooth, and surrounded by a papillate area (fig. 8). The left ventral arm is *hectocotylised* (figs. 4, 5); along three-fourths of its length runs a groove with convex bottom, bounded on either side by a narrow fillet; on either margin of the groove is a row of minute suckers, which are larger and more distinct, and even form two series on

[1] So named from the form of the hectocotylised arm.

the ventral aspect; the tip of the arm bears two series of small suckers. The *umbrella* is better developed than usual, its greatest extent (between the lateral arms) being up to the eighth rows of suckers. The *buccal membrane* has the usual seven points, but not very strongly marked; the *outer lip* is smooth and thin, the *inner* papillate.

The Tentacle is as long as the head and body together, with a slender and somewhat flattened stem; the *club* (fig. 3) is short and rather broad, and has a protective membrane on either side of the suckers, and a broad web on the dorsal aspect, extending for a distance equal to half its length down the stem; there are from six to eight rows of very minute *suckers*, subequal, and with smooth *horny rings*.

The Surface is smooth, except that on one side of the ventral surface are three slightly raised linear ridges, apparently due to contraction, and a few minute papillæ on the dorsal surface posteriorly.

The Colour is on the whole pale, yellowish below, purplish above.

The Jaws are shown in figs. 9, 10.

The Shell (figs. 11–13) is hemielliptical in *outline* anteriorly, tapering to a point behind. The *chitinous margin* is rather broad, widest about two-thirds back; it is bare over all except the median third of the *dorsal surface*, which is finely rugose, and has a slightly elevated median portion and a faint linear ridge in the middle line posteriorly, about 3 mm. long, and terminating 2 mm. from the base of the spine. The *ventral surface* is but little elevated; the *last loculus* occupies more than one-third of it, and its posterior boundary is almost semicircular, inflected in the centre. The *inner cone* is evanescent; its limbs are chitinous and form a ventral margin to the terminal cone. A *spine* is present, but, as it had been broken off, its length and form cannot be determined.

Dimensions.

Length, total,	112 mm.
End of body to mantle-margin,	45 „
End of body to eye,	49 „
Breadth of body,	25 „
Breadth of head,	22 „
Eye to edge of umbrella,	12 „
Breadth of fin,	5 „
Diameter of largest sucker on sessile arm,	0·5 „
Diameter of largest sucker on tentacle,	0·16 „
Length of shell,	52 „
Breadth of shell,	21 „

	Right.	Left.
Length of first arm,	22 mm.	22 mm.
Length of second arm,	23 „	23 „
Length of third arm,	24 „	24 „
Length of fourth arm,	26 „	25 „
Length of tentacle,	65 „	63 „

The shell of this species is peculiar in having a spine as well as, near to but distinct from it, a keel, upon the dorsal aspect of the shell. *Sepia elegans*, d'Orb., has the keel but no spine, while an unnamed specimen from the Cape in the Copenhagen Museum has a stronger keel reaching quite up to the spine, which is larger and thinner than in this specimen.

The tentacular club is like that of *Sepia brevimana*, Steenstrup.

The integument in the middle of the back has been pierced down to the shell by a neat round hole, presumably the work of some parasite (see fig. 2).

Sepia andreanoides, Hoyle (Pl. XXI. figs. 11–19; Pl. XXII. fig. 11).

1885. *Sepia andreanoides*, Hoyle, Diagnoses II., p. 193.
1885. „ „ Hoyle, Prelim. Rep. II., p. 297.

Habitat.—Japan. Purchased in the market, Yokohama. Three specimens, one ♂, two ♀.

The Body is very long, broadest one-third of the way back, pointed and acuminate behind. The fins are narrow, they commence 3 mm. behind the anterior margin, and terminate 5 mm. from the posterior end of the body, and, approaching within 3 mm. of each other, extend a little distance upon the dorsal aspect of the body. The *mantle-margin* extends well over the head dorsally, and is very slightly emarginate ventrally. The *siphon* extends about as far forward as the middle of the eyes, but not up to the space between the ventral arms.

The Head is decidedly narrower than the body and somewhat elongated; the *eyes* being distended and laterally prominent.

The Arms are subequal, the order of length being 1, 2, 3, 4, or 1, 4, 3, 2; they are two-fifths the length of the body, elongated, conical (except the fourth pair, which are flattened), and taper to very slender tips. The *suckers* seem to be normally in four series, but in some cases the arms are so compressed that they appear to be in only two, especially at the proximal extremities of the first and second arms; they are globular, slightly oblique, with a small aperture and smooth *horny ring* (fig. 17). The distal half of the left ventral arm of the male is *hectocotylised* (Pl. XXII. fig. 11); the suckers are normal up to the twelfth row, after which the arm widens and has a median groove from which about twelve shallow grooves pass outwards on either side, separating raised portions, each of which bears a minute sucker on the dorsal side of the groove. The *umbrella* is present only between the second and third and third and fourth arms up to the fourth row of suckers. The *buccal membrane* is well developed and has the usual seven points; in the female there is a deeply grooved *spermatic pad*. The *outer lip* is thin and smooth, the *inner* thick and papillate.

The Tentacles are somewhat longer than the head and body, very slender and some

what flattened. The *club* (Pl. XXI. fig. 13) is flattened and expanded; along its outer margin is a very narrow membrane, and along the median edge, at some distance from the cupules, is a broad web, marked on the dorsal aspect with fine parallel shallow oblique grooves; along one margin it bears three or four series of small pedunculate *suckers*, whose *horny rings* bear very numerous and acute teeth.

The Surface is smooth.

The Colour is a dull purplish grey above, ochre with purple chromatophores below.

The Jaws are shown in figs. 18, 19.

The Shell (figs. 14–16) has a narrow elongated oval *outline*, somewhat pointed in front and tapering gradually backwards; the *chitinous margin* is uncovered over about one-third of the *dorsal surface*, which shows the boundary lines of the loculi clearly as brown striæ, and is very minutely roughened; the *ventral surface* is elevated, so that the shell is thick in proportion to its breadth, a narrow groove runs down the centre; the *last loculus* has an index of 28·3 in the male and 30·5 in the female, and is bounded posteriorly by a shallow open curve. The *posterior extremity* is a very flattened irregular cone, to the apex of which the spine is attached; the *inner cone* is very shallow and its opening is some 4 mm. distant from the margin of the outer cone. The *spine* is long, straight, and points directly backward.

Dimensions.[1]

Length, total,	177 mm.
End of body to mantle-margin,	60 „
End of body to eye,	62 „
Breadth of body,	27 „
Breadth of head,	19·5 „
Eye to edge of umbrella,	9 „
Breadth of fin,	3 „
Diameter of largest sucker on sessile arm,	0·6 „
Diameter of largest sucker on tentacle,	0·25 „
Length of the shell,	60 „
Breadth of the shell,	12·5 „

	Right.	Left.
Length of first arm,[2]	35 mm.	25 mm.
Length of second arm,	31 „	25 „
Length of third arm,	28 „	28 „
Length of fourth arm,	28 „	27 „
Length of tentacle,	90 „	115 „

This species resembles *Sepia andreana*, Steenstrup, from Hako Dadi, Japan, very closely in the form of the shell, which, however, is here a little thicker and broader in proportion to its length; in both, too, the ventral and third arms have a strong keel; the suckers are in four series except a varying number (two to four rows) at the

[1] Of the male specimen. In one of the females the shell is 59 mm. long and 13 mm. broad.

[2] The lengths of the arms are measured from the eye.

beginning of the arms; the suckers are small and globular and the highest power of a hand-lens shows no teeth on their horny rings.

Sepia andreana is distinguished by the extraordinary development of the second arms, which are nearly twice as long as the others, and by the greater shortness of the tentacular club, which bears a single median row of five suckers larger than the others. The suckers on the tips of the longest sessile arms are in two series.

In one specimen the tentacles were completely exserted, in another partially, in the third completely retracted, in which condition they could be distinctly traced through the integuments on the under surface of the head disposed in close windings (Pl. XXI. fig. 11).

Sepia kiensis, Hoyle (Pl. XVII. figs. 6–11).

1885. *Sepia kiensis*, Hoyle, Diagnoses II., p. 194.
1885. „ „ Hoyle, Prelim. Rep. II., p. 299.

Habitat.—Station 192, off the Ki Islands, Arafura Sea, September 26, 1874; lat. 5° 49′ 15″ S., long. 132° 14′ 15″ E.; 140 fathoms; blue mud. One specimen, ♀.

The Body is narrow, widest anteriorly, and tapering gradually backwards; the *fin* is narrow, less than one-quarter the breadth of the body, widening a little behind; it commences 1 mm. from the anterior margin and extends to within 2 mm. of its fellow behind. The *mantle-margin* is prominent dorsally and slightly emarginate ventrally. The *siphon* does not quite extend to the bases of the arms.

The Head is broad, and the *eyes* rounded and prominent.

The Arms are subequal, the order of length being 4, 3, 2, 1; they are very short, about one-third the length of the body; the first and second are conical, the third flatter, with a slight ridge externally, and the fourth broad and flat with a distinct crest. The *suckers* are in four series throughout, small, spheroidal, and not very oblique; the *horny ring* is smooth. The specimen being a female no *hectocotylus* is developed. The *umbrella* is evanescent, extending at most only up to the second row of suckers; the *buccal membrane* has five points and is rounded dorsally; the *spermatic pad* is but slightly developed. The *outer lip* is thin and grooved longitudinally, the *inner* thicker and papillate.

The Tentacles are as long as the head and body; the *stem* being slender and indistinctly three-sided. The *club* (fig. 8) is very slightly expanded; a protective membrane, grooved obliquely on the dorsal aspect, is situated on the outer margin, and there is a web on the internal side. The *suckers* are in four or five series, which are slightly larger towards the inner margin; the *horny ring* presents a few acute teeth.

The Surface is smooth throughout.

The Colour is a dull reddish grey above, yellowish below.

The Shell (figs. 9-11) is very elongate oval in *outline;* the free *chitinous margin* is very narrow and only slightly uncovered on the *dorsal surface*, which is finely granular and marked by the divisions between the loculi; the *ventral surface* is somewhat elevated and marked by a distinct but not very deep median groove; the *last loculus* has an index of 40·5, and is bounded posteriorly by an almost semicircular line; the *striæ* are very close; the limbs of the *inner cone* arise about midway along the shell, pass backwards as low, narrow, smooth fillets, and unite behind without forming any deep cavity; the *posterior extremity* is curved towards the ventral aspect and ends in a narrow blunt *outer cone*, to the apex of which is attached the straight dorsally directed spine.

Dimensions.

Length, total,	82 mm.
End of body to mantle-margin,	37 „
End of body to eye,	34 „
Breadth of body,	18 „
Breadth of head,	15 „
Eye to edge of umbrella,	4 „
Breadth of fin,	3 „
Length of the shell,	37 „
Breadth of the shell,	11 „

	Right.	Left.
Length of first arm,[1]	8 mm.	9 mm.
Length of second arm,	9 „	9 „
Length of third arm,	10 „	10 „
Length of fourth arm,	10 „	10 „
Length of tentacle,	...	45 „

The posterior extremity of the shell of this form closely resembles that of *Sepia andreana*, Steenstrup, from Japan, but both animal and shell are much wider as well as thicker in proportion to the length. Furthermore, the arms are subequal, whereas in Steenstrup's type those of the second pair are nearly twice as long as the others. In the Challenger specimen also the tentacular club is long, narrow, and provided with subequal suckers, while in *Sepia andreana* it is shorter and there are five larger suckers along its middle.

Sepia kobiensis, Hoyle (Pl. XVIII. figs. 7–14; and woodcut 7).

1885. *Sepia kobiensis*, Hoyle, Diagnoses II., p. 195.
1885. „ „ Hoyle, Prelim. Rep. II., p. 300.
1886. „ „ Appellöf, Japanska Ceph., p. 20, pl. iii. fig. 7.

Habitat.—Station 233, Bay of Kobé, Japan, May 17, 1875; lat. 34° 39′ N., long. 135° 14′ E.; 8 fathoms; mud. One specimen, ♀.

[1] Measured from the oral margin.

The Body is long and narrow, widest near the anterior margin, and tapers gradually backwards. The *fin* is very narrow, only one-eighth the breadth of the body; it commences 3 mm. from the margin of the body, and posteriorly passes on to the ventral surface, and terminates 2 mm. from its fellow and 4 mm. from the extremity of the body. The *mantle-margin* has a narrow projection over the head, and is evenly truncated ventrally. The *siphon* is short, reaching barely halfway to the space between the ventral arms.

Fig. 7.—*Sepia kobiensis*; side view, showing how the fins terminate on the ventral surface of the body.

The Head is of medium breadth, and the *eyes* prominent laterally.

The Arms are subequal, the order of length being 2, 4, 1, 3(?), and less than one-third the length of the body; the first two pairs are subconical and slender, the third broader and with a web running up the ventral aspect, the fourth wider and with a distinct ridge along the outer edge; they all taper to very fine points. Many of the *suckers* are deficient, but they seem to have stood in four series throughout; they are spheroidal (fig. 11) and very oblique, the distal margin of many has a deep notch (fig. 10); the *horny ring* is smooth in most cases, but occasionally possesses a few angular teeth. The specimen being a female no *hectocotylus* is present. The *umbrella* is but little developed, its greatest extent being between the ventro-lateral arms, where it reaches the fourth row of suckers. The *buccal membrane* has the usual seven points, the two ventral being the least distinct (as usual in female specimens); the *spermatic pad* is small. The *outer lip* is narrow, the *inner* thick and papillate.

The Tentacles are shorter than the body and slender; the *stem* has three sides, the inner being slightly hollow, with a slender fillet along the middle. The *club* (fig. 9) is slightly expanded with a distinct protective membrane; the inner side of the club is deeply grooved, and internally to the groove is a rather broad fin. The *suckers* are in about five series, near the inner margin are three rather larger than the rest,[1] which gradually diminish towards the outer margin. The *horny rings* of the larger suckers have about twenty fine teeth on the distal semicircumference, the smaller have fewer in proportion.

The Surface is smooth all over.

The Colour is a dark purplish grey above, paler below.

The Shell (figs. 12–14) is a very elongated oval in outline; the *chitinous margin* is very narrow and is uncovered over one-third of the *dorsal surface*, which is smooth and evenly convex, with the exception of a slight ridge along the middle line; the *ventral*

[1] Not adequately shown in the figure.

surface is elevated, so that the shell is thick, with a shallow median groove becoming evanescent posteriorly, the *last loculus* has an index of 36·6 and is bounded by a slightly curved line with a cusp where the median groove meets it; the *inner cone* is formed by two limbs, which arise halfway along the shell and form a rounded fillet slightly more elevated posteriorly, where they bound a shallow depression; outside them the margin of the shell expands into a subcircular plate (the *outer cone*), from the centre of which the *spine* projects backwards; no information can be given as to its form or length, as it has been broken off close to the base.

Dimensions.

Length, total,	72 mm.
End of body to mantle-margin,	42 „
End of body to eye,	41 „
Breadth of body,	16 „
Breadth of head,	14 „
Eye to edge of umbrella,	6 „
Breadth of fin,	2 „
Length of shell (without spine),	41 „
Breadth of shell,	7 „

	Right.	Left.
Length of first arm,	10 mm.	10·5 mm.
Length of second arm,	11 „	10 „
Length of third arm,	9·5 „	9 „
Length of fourth arm,	9 „[1]	10·5 „
Length of tentacle,	25 „	...

This is nearly related to *Sepia kiensis*, but is longer and narrower in its proportions, notwithstanding that both specimens are females, and this difference is still more marked in the shell; in that species its breadth is about two-fifths of the length, while in the present form it is less than one-fifth; in the former case the locular index is 40·5, in the latter 36·6. The type specimens of both species are probably immature, and their validity can only be regarded as of a provisional nature.

Since the above description was drawn up I have been able to see Appellöf's description of the specimens of this form which he received from Japan; his account of them agrees so well with the type specimen that there can be little doubt that they are correctly referred to the same species. I notice a few differences, however, which it seems advisable to record. The arms are considerably larger, proportionately, than in the Challenger specimen, in which furthermore the diversity in the sizes of the suckers on the sessile arms is scarcely apparent. As stated above, many of these were absent, but a renewed investigation has led me to think that Appellöf's account of their arrangement is probably correct, though, like him, I regarded their disposition in two rows as merely

[1] Mutilated.

apparent, and consequently described them as "seeming" to be in four series. The shell of the Challenger specimen is decidedly narrower than the one figured by Appellöf, and the raised median tract appears to be by no means so prominent.

Metasepia, subgen. nov.

Body short, rounded, thick dorso-ventrally; *nuchal cartilage* without linear groove and *mantle* devoid of corresponding ridge; *siphono-pallial* articulation deep.

Tentacular club with unequal suckers.

Shell rhomboidal in outline, with no calcareous covering on the dorsal surface of the chitinous sheet; no *spine*.

Sepia (*Metasepia*) *pfefferi*,[1] Hoyle (Pl. XXI. figs. 1–10).

1885. *Sepia* (*Metasepia*) *Pfefferi*, Hoyle, Diagnoses II., p. 199.
1885. „ „ „ Hoyle, Prelim. Rep. II., p. 304.

Habitat.—Station 188, south of Papua, in the Arafura Sea, September 10, 1874; lat. 9° 59′ S., long. 139° 42′ E.; 28 fathoms; green mud. One specimen, ♀.

The Body is short and stout, broadest about the middle of its length, very thick (dorso-ventrally), and bluntly rounded behind. The *fins* are one-fourth as broad as the body and placed much nearer the dorsal than the ventral surface; they commence 2 to 3 mm. from the anterior margin and are connected by a narrow fillet behind; a slightly raised ridge passes down the ventro-lateral aspect of the body. The *mantle-margin* projects very slightly dorsally and is a trifle emarginate opposite the funnel; the *nuchal cartilage* has no distinct linear groove as in most species, but only a slight depression, while the corresponding part of the mantle has a triangular eminence about half as broad as long, and with the rounded apex directed forwards; the *connective cartilages* are deeper than in most species of *Sepia*, but there is no distinct knob as in *Sepiella*, their greatest depth being in the middle not anteriorly; there is no posterior gland. The *siphon* reaches up to the depression between the ventral arms.

The Head is broad, and the *eyes* prominent.

The Arms are subequal, in order of length 3, 4, 2, 1, or 4, 3, 2, 1; they are rather more than half as long as the body and distinctly three-sided, having a ridge on the outer side of each, broadest on the ventral ones; they taper evenly to very fine points; the inner surface of each is roughly papillate, and has hemispherical depressions into which the suckers are retracted. The *suckers* are in four series throughout, almost hemispherical, not very oblique, and marked with meridional grooves; the *horny ring* bears irregular square teeth. The *hectocotylus* is not developed, the specimen being a

[1] Named after my friend Dr. Georg Pfeffer of the Hamburg Museum, who has recently published a valuable catalogue of the Cephalopoda of that institution.

female.[1] The *umbrella* is larger than usual in the genus, reaching on an average about one-third up the arms; the *buccal membrane* has seven not very prominent points, and there is a *spermatic pad* as usual (fig. 3); the *outer lip* is very thin, the *inner* thick and papillate.

The Tentacle is about as long as the body, stout, indistinctly three-sided, and tapering. The *club* (fig. 7) is short and but little expanded, with a narrow protective membrane on its outer side; the sucker-bearing area is, as it were, undermined on its inner aspect by a deep groove or fissure, and internally to this again is a broad fin which reaches down the tentacle for a distance exceeding half the length of the club. There are three *suckers* much longer than the rest, whereof the middle one is the largest and the proximal the next, placed on stout peduncles arising in deep depressions; towards the outer side of the club is a series of about four medium-sized suckers, and beyond these again one or two series of minute ones. The *horny rings* appear smooth under a powerful hand-lens, though the microscope reveals a fine irregular denticulation.

The Surface is smooth in general, but there are a few irregular papillæ in the ventro-lateral region.

The Colour is a dull grey, with indications of annular markings on the back disposed in the form of a cross (fig. 1).

The Shell (figs. 4, 5) has a rhomboidal *outline*, with rounded anterior and lateral angles; the *chitinous margin* is narrow, widest behind, where it forms a flat, acute-angled plate, the posterior extremity of the shell; it covers entirely, however, the *dorsal surface*, which is slightly raised mesially and marked by a number of faint striæ radiating from the posterior end. The *ventral surface* is much elevated on either side of a median groove; the *last loculus* is bounded by a wavy line, and deeply emarginate in the middle; it has an index of 22. The *inner cone* is represented only by a narrow rib reaching halfway along each posterior side of the shell and meeting its fellow in a rounded angle behind, from which a number of radiating calcareous streaks pass outwards into the horny termination.

Dimensions.

Length, total,	110 mm.
End of body to mantle-margin,	52 „
End of body to eye,	60 „
Breadth of body (excluding fin),	32 „
Breadth of head,	32 „
Eye to edge of umbrella,	18 „
Breadth of fin,	8 „
Diameter of largest sucker on sessile arm,	1 „
Diameter of largest sucker on tentacle,	2 „
Length of shell,	45 „
Breadth of shell,	24 „
Thickness of shell,	8 „

[1] Appellöf records that he found no trace of the formation of the hectocotylus in the male examined by him.

	Right.	Left.
Length of first arm,	30 mm.	25 mm.
Length of second arm,	36 „	30 „
Length of third arm,	36 „	31 „
Length of fourth arm,	30 „	32 „
Length of tentacle,	52 „	67 „

This interesting species is represented in the collection by only one female specimen, but exhibits such peculiarities as to render it worthy of great attention.

The form of the body is remarkable for its great dorso-ventral extent, and for the ridge which runs down the ventro-lateral aspect. This is not very prominent, but is similar to the ridge observed in many species of *Octopus* and *Eledone* (*e.g.*, *Octopus australis*, p. 88 and Pl. III. fig. 5, and *Eledone cirrosa*), but I do not remember to have seen it before in any specimen of *Sepia*.

The tentacular club bears the greatest resemblance to that of *Sepia elegans*, d'Orbigny,[1] in respect of its shortness and rounded form, and in the presence of three suckers considerably exceeding the others in size. *Sepia tuberculata*, Quoy and Gaimard, has also three enlarged suckers, but judging by d'Orbigny's figure,[2] these would seem to be along the median line of the club and not nearer to one side than the other as in the present form. It may be remarked, however, that very few, if any, species of *Sepia* have the club so symmetrical as that figure would indicate, and hence the possibility of inaccuracy in this respect must be borne in mind. This is especially important because, as will be seen immediately, these two species present, in one respect, a close resemblance to each other.

The shell of the type under consideration is undoubtedly its most remarkable characteristic. In the first place it possesses no trace of a spine, a point in which it resembles *Sepia elegans*, d'Orbigny, above alluded to, and also the various species of *Sepiella*, which latter it further resembles in the depth of the siphono-pallial articulation; in all these, however, the chitinous layer of the shell is covered for the most part by a rough calcareous deposit, and only appears at the margin, and the genus *Sepiella* is clearly distinguished by its peculiar glandular apparatus.

The chitinous portion of the shell of *Sepia pfefferi* is visible over the whole of its dorsal surface, and this fact separates it clearly from all *Sepiæ* or related forms, with two exceptions, *Sepia tuberculata*, Lamarck,[3] and *Hemisepius typicus*, Steenstrup.[4] The former of these has an oval shell, the calcareous portion coming close up to the anterior margin, but narrowing so as to leave large projecting chitinous wings posteriorly, whilst in the form under discussion the chitinous plate is but little larger than the calcareous portion all round. In *Hemisepius* the chitinous plate is so large as to project far beyond the calcareous centre anteriorly as well as posteriorly.

[1] Céph. acét., Seiches, pl. xxvii. fig. 4.
[2] *Op. cit.*, pl. xvii. fig. 13.
[3] Céph. acét., pl. vi. figs. *a*, *b*, *c*.
[4] Hemisepius, Tab. i. figs. 3, 4, 5.

From these facts we should be inclined to suppose that *Sepia pfefferi* and *Sepia tuberculata* stand in a nearer relation to each other than does either of them to *Hemisepius*, which is clearly marked off by the presence of only two series of flattened suckers on the sessile arms, and the broad shape of the ventral pair of these; by the form of the tentacular club, and by the two rows of glandular pits down its ventral surface.

The three forms seem to constitute together a very aberrant branch of the group, but we have not at present sufficient knowledge to interpret their precise relations to the more ordinary forms. Indeed the problem of the natural relationship of the various species of *Sepia* is far from having been satisfactorily worked out. The shells, which seem in many respects the organs most likely to lead to a solution, can be arranged in series increasing or decreasing in complexity, and there are several interesting fossil genera,[1] which help to bridge over the gulf separating *Sepia* from the Belemnites, but an arrangement of the species based upon the shells does not agree with one based upon the form of the tentacular club, or other parts of the animal's organisation, so that we are hardly justified in regarding it as natural.

Since the above remarks were written I have received, by the kindness of Dr. Appellöf, a copy of his paper on Japanese Cephalopoda,[2] which contains the description of a new species, *Sepia tullbergi*, closely related to the present form. The two agree in the short rounded form of the body, the slight convexity of the anterior dorsal border of the mantle, the depth of the siphono-pallial articulation, the absence of the linear ridge and groove in the nuchal articulation, the disparity in the sizes of the tentacular suckers, and in the form and structure of the shell.

Such being the case, there is no doubt that *Sepia tullbergi* belongs to the group to which I have given the name *Metasepia*.

There are a number of details in which the specimen obtained by the Challenger differs from that described by Appellöf, so that it is impossible to regard them as other than distinct species.

In *Sepia pfefferi* the pits at the base of the funnel for articulation with the mantle are deepest in the middle, not at the anterior end as in *Sepia tullbergi*; there is no trace of any tubercles on the back or head; the teeth of the suckers on the sessile arms are finer and more acute, not so broadly triangular, as indicated in Appellöf's figure (pl. ii. fig. 13); the tentacles are decidedly shorter and the large suckers on the club are not so conspicuous (compare pl. ii. fig. 8, with Pl. XXI. fig. 7 of the present Report, where indeed they are hardly large enough); the denticulation of their horny rings, too, is much finer and not so regular.

The shell agrees in almost every particular with Appellöf's description, except that the posterior extremity, although somewhat thickened, does not give rise to any structure at all like the horny lamella indicated by his figure (pl. ii. fig. 11, *a*).

[1] For interesting remarks on some of these see Lankester, *Quart. Journ. Micr. Sci.*, N.S., vol. xiv. p. 372, 1874.

[2] *K. Svensk. Vetensk. Akad. Handl.*, Bd. xxi. No. 13, pp. 1–40, pls. i.–iii.

Sepiella, Gray, Steenstrup.

This generic name was first informally proposed by Gray[1] in 1849, but no adequate account was given of its characters, until in 1880 Steenstrup[2] published a paper which was then a complete Monograph of the genus, and to which nothing of importance has been added since.

Three conspicuous characters occur in both sexes of all members of this group, which can hardly be expressed better than in Steenstrup's Latin diagnosis, here quoted.

"*Sepiella* . . . . præbet;—

"1. Sepium minus validum, inerme, neque rostro seu mucrone (ut in plurimis Sepiis) neque carina (ut in *Sep. elegante*, d'Orb.) dorsali ornatum.

"2. Fibulam palliarem complicatam, conulo nempe elevato, in profundam cavitatem siphunculo recipiendo instructam.

"3. Saccum subcutaneum, inter sepium et cutem dorsualem pallii situm, valde plicatum, plicis pluries divisis et inter se connexis, apertura sat conspicua in pagina inferiori abdominis inter radices pinnarum præditum."

Steenstrup enumerated two species in this genus, one being the *Sepia ornata*, Rang, the other *Sepia inermis*, v. Hass., of which he showed *Sepia microcheirus*, Gray, to be the female; having recently had the opportunity of examining Gray's types in the British Museum I can fully comfirm all his statements on this head. Last year, however, Dr. Pfeffer described four species and Dr. de Rochebrune another (see p. 25), whilst it seems to me likely that two forms of his *Diphtherosepion* should be referred to this genus.

One very fine specimen was obtained by the Challenger Expedition from the Inland Sea, Japan, which I have not suceeeded in certainly identifying with any of the species hitherto described. It does not present any important variation from the definition given of *Sepiella maindroni*, Rochebr., but so many important details are wanting in the description of this type that certainty is impossible, but I have judged it best to apply his name to the Challenger specimen, rather than create a new species unnecessarily.

Sepiella maindroni (*?*), de Rochebrune (Pl. XXII. figs. 1–10).

1884. *Sepiella maindroni*, Rochebr., Monogr. Sepiadæ, p. 89.

Habitat.—Inland Sea, Japan. One specimen, ♀.
Pondichery (de Rochebrune).

I cannot find any difference between the specimen in the Challenger collection and Dr. de Rochebrune's description, but in this latter so many points of specific import-

[1] Gray, Brit. Mus. Cat., p. 106.

[2] *Vid. Meddel. nat. Foren. Kjøbenhavn*, pp. 347-356, 1880.

ance are omitted (even the sex of the specimens not being mentioned), that there is still uncertainty as to the correctness of the identification.

I therefore add details, which are not given by the original describer, but which will show whether or not the two forms are identical.

The Suckers (figs. 2, 3) of the sessile arms are nearly hemispherical, with numerous meridional grooves which pass obliquely towards their distal side; the *horny ring* is smooth, and the *papillary area* unusually wide.

The Suckers of the tentacular club are in about ten rows, hemispherical in form, and mounted on long peduncles (fig. 4); the *horny ring* bears in its distal semicircumference from fifteen to twenty rather irregular conical teeth (fig. 6), and is surrounded by a *papillary area* with three rows of little spines and two of irregular plates (figs. 5, 7).

The Shell (figs. 8, 9, 10) is elliptical in *outline*, except that the posterior extremity is somewhat expanded; the *dorsal surface* has fine rugosities disposed in curves parallel to the anterior margin, and a raised ridge passes along its middle; the *chitinous margin* appears along the edges, and extends some distance beyond them: it is curved downwards and inwards laterally, while posteriorly it expands into the hemielliptical plate characteristic of the genus; the *ventral surface* is elevated so that the shell is thick, the *striated area* is not hollowed but has several slight grooves passing along it from back to front; the *last loculus* has an index of 33, and is bounded posteriorly by a somewhat irregularly waved line. The *inner cone* is represented only by a small fillet of calcareous matter from which the limbs pass forwards as thin tapering strips, which extend forwards along only one-third of the striated area.

The Colour is pale yellowish below, and of a dark slate tint above, with no trace of the remarkable patch over the posterior sac, which is seen in d'Orbigny's figures.[1]

Dimensions.

End of body to mantle-margin,	125 mm.
End of body to eye,	122 „
Breadth of body,	48 „
Breadth of head,	42 „
Eye to edge of umbrella,	28 „
Breadth of fin, average,	10 „

	Right.	Left.
Length of first arm,	43 mm.	42 mm.
Length of second arm,	35 „	36 „
Length of third arm,	40 „	40 „
Length of fourth arm,	45 „	35 „
Length of tentacle,	70 „	...

[1] Céph. acét., Seiches, pl. xx. fig. 1, pl. xxii. fig. 1.

Family IX. Loliginei, Steenstrup.

Sepioteuthis, Blainville.

Sepioteuthis lessoniana, Férussac.

1825.	*Sepioteuthis lessoniana*,	d'Orb., Tabl. méth., p. 155 (*nomen tantum*).
1830.	„	„	Lesson, Voy., "Coquille," Moll., p. 241, pl. xi.
1839.	„	„	d'Orb., Céph. acét., p. 301, Sépioteuthes, pls. i. vi. figs. 9–14.
1849.	„	„	Gray, Brit. Mus. Cat., p. 80.
1886.	„	„	Appellöf, Japanska Ceph., p. 31.

Habitat.—From the surface of the harbour, Kandavu, Fiji, August 1874. One specimen, ♂.

Ternate, October 15 to 17, 1874. One specimen, ♂. (Presented by the Resident.)

New Guinea, Java, Cape Fabre, Trincomalee (d'Orbigny); New Zealand (Gray); Japan (Appellöf).

Both the Challenger specimens agree so well with d'Orbigny's description that I have no hesitation in referring them to this species. The individual from Ternate being the largest that has come under my notice, I append its dimensions.

Dimensions.

Length, total,	570 mm.
End of body to mantle-margin,	195 „
End of body to eye,	215 „
Breadth of body,	85 „
Breadth of head,	50 „
Eye to edge of umbrella,	33 „
Breadth of fin,	45 „
Length of hectocotylus,	27 „
Diameter of largest sucker on sessile arm,	4·5 „
Diameter of largest sucker on tentacle,	5·5 „

	Right.	Left.
Length of first arm,	70 mm.	66 mm.
Length of second arm,	85 „	80 „
Length of third arm,	90 „	98 „
Length of fourth arm,	95 „	100 „
Length of tentacle,	320 „	335 „

The hectocotylisation is of the type common in this genus and *Loligo;* it occupies the distal fourth of the arm; the suckers diminish in size and their peduncles become large swollen cones, and eventually these entirely replace the suckers.

Loligo, Lamarck.[1]

Loligo edulis, Hoyle (Pl. XXIII.).

1885. *Loligo edulis*, Hoyle, Diagnoses II., p. 186.
1885. „ „ Hoyle, Prelim. Rep. II., p. 289.

Habitat.—Yokohama, Japan. Purchased in the market. One specimen, ♂.

The Body is moderately stout, being about three times as long as broad, cylindrical in its anterior third, and tapering gradually to a bluntish point. The *fin* occupies a little more than half the length of the body; it is rhomboidal, not quite so broad as long, and broadest anteriorly to the middle; the lateral angles are rounded. The *mantle-margin* has a slight projection in the dorsal median line and a broad shallow sinuate excavation ventrally. The *siphon* is of moderate length and bluntly pointed.

The Head has prominent rounded *eyes*, and the usual auricular crest and preocular pore.

The Arms are unequal, the order of length being 3, 4, 2, 1, and about half as long as the body. The first are very slender and bear a distinct keel on the dorsal aspect; the second are thicker and triangular, and have a broad keel almost expanding into a web on the lateral aspect; the third are the stoutest, flattened from above downwards, and distinctly keeled externally; the fourth are intermediate between the third and second, triangular, and with a broadish web extending the whole way up the dorso-lateral aspect. They all have a web up each side of the inner face. The *suckers* (figs. 3, 4) are in two series, very oblique, and with slender conical peduncles, their size varying with that of the arms on which they are situated; the *horny ring* bears about eight long square-cut teeth on its distal margin. The left ventral arm as usual is *hectocotylised*, and bears proximally ten rows of suckers, then a minute sucker with an exaggerated peduncle, and beyond this two series of long conical papillæ (fig. 5). The *buccal membrane* has the usual seven angles produced into long lappets, each of which bears about eight suckers in two rows; the *outer lip* is moderately thick, the *inner* much thicker and marked with deep radial grooves.

The Tentacles are about as long as the body, with flattened *stems;* about one-third their length is occupied by the *club* (fig. 6), which is only slightly expanded, has a protective membrane on either side, but a dorsal web is present only at the extremity. The central *suckers* (fig. 7) are about sixteen in number and about one-third larger than the lateral; the proximal are about ten, the distal are closely packed in four series. The

[1] Gwyn Jeffreys (Brit. Conch., vol. v. p. 130) gives "Schneider" as the authority for this genus, but without any reference or even date. The only paper by that author bearing in any way upon the subject, which I have been able to find, is one entitled Bemerkungen über die Gattung der Dintenfische (*Schrift. Gesellsch. naturf. Freunde Berlin*, Bd. xi. pp. 33–50, 1794). In it this passage occurs (p. 46), "Ich finde auch damit eine Zeichnung ganz übereinstimmig, welche ich von dem Lungenherze des Kalamers (Loligo) entworfen habe." This does not, however, seem to be of the nature of a definition, and so I have followed the majority of writers in attributing the creation of the genus to Lamarck.

horny rings of the largest suckers (fig. 8) are provided with about twenty larger teeth, with which smaller ones alternate somewhat regularly; the lateral bear about ten distant acute teeth on the outer margin, while the proximal and distal groups are similarly armed on the distal margin.

The Surface is smooth.

The Colour is a dull yellow with purplish chromatophores.

The Gladius (fig. 9) is of the usual form, the narrow anterior portion being less than one-fourth of the total length.

Dimensions.

Length, total,	260 mm.
End of body to mantle-margin,	115 „
End of body to eye,	126 „
Breadth of body,	31 „
Breadth of head,	26 „
Eye to edge of umbrella,	15 „
Length of fin,	67 „
Breadth of fin,	63 „
Breadth of each lobe,	21 „
Length of hectocotylus,	35 „
Diameter of largest sucker on sessile arm,	2 „
Diameter of largest sucker on tentacle,	2 „

	Right.	Left.
Length of first arm,	41 mm.	45 mm.
Length of second arm,	52 „	51 „
Length of third arm,	57 „	60 „
Length of fourth arm,	52 „	51 „
Length of tentacle,	105 „	115 „

Loligo edulis seems to find its nearest ally in *Loligo pealei*, Les., whose habitat is very far removed from its own, but it differs in the form and number of the teeth on the suckers. It is quite clearly distinguished from all other forms from the same region.

Loligo brasiliensis, Blainville.

1823. *Loligo brasiliensis*, Blv., Journ. de Phys., t. xcvi. p. 132.
1833. *Loligo poeyanus*, Fér., Pl. de Calmars, xix. figs. 1–3.
1835. *Loligo brasiliensis*, d'Orb., Amér. mérid., p. 63.
1838. „ „ d'Orb., Moll. des Antilles, t. i. p. 38.
1839. „ „ d'Orb. et Fér., Céph. acét., p. 313; Calmars, pl. xii., pl. xix. figs. 1–3, pl. xx. figs. 1–5.
1853. „ „ d'Orb., Cuba Moll., p. 38.

Habitat.—Station 321, off Monte Video, February 25, 1876; lat. 35° 2′ S., long. 55° 15′ W.; depth, 13 fathoms. Six specimens, 2 ♀, 4 immature.

Coasts of Brazil, the Antilles, Cuba (d'Orbigny).

I have no hesitation in referring these specimens to de Blainville's species; in general appearance they agree rather with the figure of *Loligo poeyana* (*op. cit.*, pl. xix.) than with the one on pl. xii., and in one specimen, at all events, there is a slight notching of the fin at its anterior insertion. There is some discrepancy between d'Orbigny's description and figure (pl. xx. figs. 3, 4) in respect of the horny ring of the large tentacular sucker, which is said to be "armé tout autour de dents . . . . . d'égale grosseur," while the teeth are depicted as distinctly larger along one side of the ring than the other; the Challenger specimens agree with the figure.

The teeth in the suckers of the sessile arms present a slight variation, inasmuch as the three median teeth are considerably narrower than the lateral ones.

A specimen of *Loligo brasiliensis* in the Copenhagen Museum has the teeth of these suckers alternately large and small, showing an interesting approach to *Loligo pealei*, Les. to which this species is undoubtedly nearly related.

The two larger specimens have a distinct spermatic pad within the ventral border of the buccal membrane, very similar to that shown in Pl. XXV. fig. 4.

Loligo kobiensis, Hoyle (Pl. XXV. figs. 1–10).

1885. *Loligo kobiensis*, Hoyle, Diagnoses II., p. 184.
1885. „ „ Hoyle, Prelim. Rep. II., p. 287.

Habitat.—Station 233, Bay of Kobe, Japan, May 17, 1875; lat. 34° 39′ N., long. 135° 14′ E.; 8 fathoms; mud. One specimen, ♀.

Station 233c, Inland Sea, Japan, May 28, 1875; lat. 34° 18′ N., long. 133° 21′ E.; 12 fathoms; blue mud. Four immature specimens.[1]

The Body is cylindrical in the anterior moiety, tapers posteriorly, and ends in a blunt point. The *fin* is more than half the length of the body, trapezoidal, with rounded lateral angles; the extreme breadth is less than the length, and is situated anteriorly to the middle of the fin. The *mantle-margin* presents a triangular process in the mid-dorsal line and is deeply sinuate ventrally. The *siphon* is short and bluntly conical.

The Head is short and not so broad as the body; the *eyes* are comparatively small and have a bow-shaped auricular crest behind and a minute pore in front of them.

The Arms are unequal, the order of length being 3, 4, 2, 1, and, on the average, rather more than one-third the length of the body; the first are the most slender, and have the dorso-median angle raised into a prominent keel; the second have only a faintly-marked angle ventro-laterally; the third have a broad web externally, passing over at the base into one which extends up the dorsal aspect of the ventral arms. The *suckers* (figs. 2, 3) are arranged in two series, pedunculate, very oblique, and rather larger on the lateral than on the other arms; the *horny ring* has about nine short, close-set, square-cut

[1] On the label attached to two of these specimens the locality was marked with a query.

teeth on its distal side, and is smooth on the proximal. The only mature specimen being a female, no *hectocotylus* was observed. The *buccal membrane* has five points, each of which bears two or three small suckers; the two ventral points are rounded off, and just within the ventral margin is a small papilla surrounded by two elevated rings, for the reception of spermatophores (fig. 4). Both the *outer* and *inner lips* are folded.

The Tentacle is faintly three-sided and shorter than the body; the *club* (fig. 5), which is expanded and triangular in section, is one-third as long; it has a protective membrane on either side and a web externally; in the centre are eight large *suckers*, three times the diameter of the lateral ones; at the proximal end are about nine suckers, gradually increasing in size, and at the distal end more than twenty rows arranged in four series, gradually diminishing. The largest suckers are scarcely at all oblique, and have the margin cut up by radial grooves, into a number of small papillæ (figs. 6, 7), an arrangement also found on the outer margin of the lateral suckers, but not in the terminal ones. The *horny rings* of the largest suckers are smooth; those of the lateral and terminal suckers bear about twelve long distant teeth on their outer margin (figs. 8, 9).

The Surface is smooth.

The Colour is pinkish-yellow, with purplish chromatophores.

The Gladius (fig. 10) has the usual form, but the narrow anterior part passes very gradually into the expanded blade.

Dimensions.

Length, total,	163 mm.
End of body to mantle-margin,	85 „
End of body to eye,	88 „
Breadth of body,	19 „
Breadth of head,	16 „
Eye to edge of umbrella,	9 „
Length of fin,	50 „
Breadth of fin,	42 „
Breadth of each lobe,	15 „
Diameter of largest sucker on sessile arm,	1·25 „
Diameter of largest sucker on tentacle,	2·75 „

	Right.	Left.
Length of first arm,	15 mm.	15 mm.
Length of second arm,	22 „	22 „
Length of third arm,	20 „[1]	31 „
Length of fourth arm,	25 „	25 „
Length of tentacle,	62 „	...

The present form differs from all known species of *Loligo* (except *Loligo reynaudii*, d'Orbigny) in the absence of teeth in the large tentacular suckers,[2] these two species

[1] Mutilated.

[2] *Loligo breviceps*, Stp. (Lenz, *Jahrb. Comm. Kiel*, Jahrg. iv. v. vi., Heft 2, Anhang 1, p. 23, 1878), has the teeth on the suckers very variable in size and number, and here and there a perfectly smooth horny ring occurs, but this does not seem likely to be confused with the constant absence of teeth observed in the two species here compared.

being readily distinguishable by the following characters:—*Loligo reynaudii* has sharp-pointed teeth in the suckers of the sessile arms, while in *Loligo kobiensis* they are blunt and closely set. The papillate character of the margins of the tentacular suckers in the latter species is a very remarkable character; it recalls the meridional grooves already described in the suckers of certain species of *Sepia* (see p. 124); and may be a parallel phenomenon with the fringes which are seen in *Loligo vulgaris* from the Mediterranean.

The left ventral arm has a number of spermatophores attached to it (fig. 4*a*), but there are none on the spermatic pad.

Loligo indica, Pfeffer (Pl. XXVI).

1884. *Loligo indica*, Pffr., Ceph. Hamb. Mus., p. 4, fig. 3, 3*a*.

Habitat.—Station 188, Arafura Sea, south of Papua, September 10, 1874; lat. 9° 59′ S., long. 139° 42′ E.; 28 fathoms; green mud. One specimen, ♀.

Station 190, also in the Arafura Sea, south of Papua, September 12, 1874; lat. 8° 56′ S., long. 136° 5′ E.; 49 fathoms; green mud. Twelve specimens, 8 ♂, 4 ♀.

Java (Pfeffer).

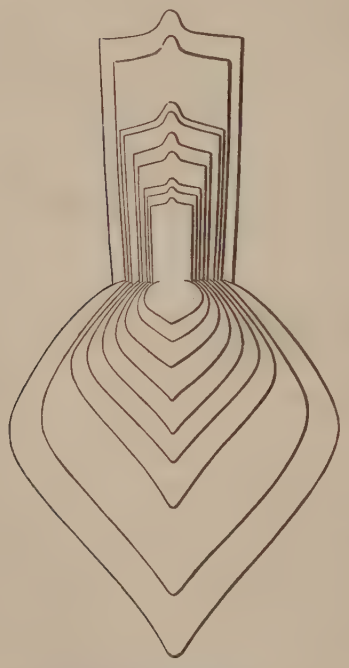

Fig. 8.—*Loligo indica:* outlines of nine specimens showing the proportional growth of the fin, and posterior portion of the body.

I had little doubt that the Challenger specimens were to be referred to the same species as the one which Dr. Pfeffer has obtained from Java, but to place the matter beyond question, I sent him a copy of the drawings which are here published with the request that he would compare it with his types. His reply was that both certainly belonged to the same species, the sole difference being that the fins are a little shorter in the Hamburg specimens.

This species is certainly very near to *Loligo duvaucelii*, d'Orbigny, differing in the number of teeth in the suckers and in the greater slenderness of the pen. Dr. Pfeffer having given merely an outline of the body and pen, I have devoted a plate to the full illustration of the species.

There being a large number of specimens in the collection of very varying sizes, the mode in which the outline of the body varies with increasing growth was brought forcibly before me. The accompanying cut, which shows the outlines of nine individuals, proves conclusively that the growth is most rapid at the posterior end of the

body, for while in the youngest stage examined the fin is much shorter than the anterior cylindrical portion of the body, in the oldest it is considerably longer. This has a very important bearing on the use of the proportionate length of the fin as a specific character; Lafont[1] has given a table of the Loligos of the French coast in which they are subdivided according as the fins are greater or less than half the length of the body. A consideration of the development shows, however, that species are not comparable in this respect unless they have attained the same stage of growth.

Loligo japonica, Steenstrup, MS. (Pl. XXIV. figs. 7–15).

... *Loligo japonica*, Steenstrup, MS. in Mus. Havn.
1885. „ „ Hoyle, Diagnoses II., p. 187.
1885. „ „ Hoyle, Prelim Rep. II., p. 290.

Habitat.—Yokohama, Japan. Purchased in the market. One specimen, ♀.

The Body is only moderately elongated, being about three times as long as broad, and bluntly pointed behind. The *fin* is a little more than half the length of the body, about as long as broad, rhomboidal, rounded laterally, and very slightly notched at the anterior angles. The *mantle-margin* curves gradually forward to a projecting point in the dorsal median line, and is deeply emarginate ventrally. The *siphon* is short and of the usual form.

The Head is comparatively large and rounded; the *eyes* are swollen and prominent.

The Arms are unequal, the order of length being 3, 4, 2, 1, and on an average about half as long as the body; the first are very small, slender, and rounded; the second have a prominent ventro-lateral angle, not amounting to a keel; the third have a distinct web on the outer aspect of the distal portion, which is continued backwards as a faint ridge, which joins the web lying along the dorsal lateral edge of the fourth. The *suckers* are in two series, and vary in size in accordance with the arms on which they are situated; they are subglobular and oblique. The *horny ring* bears about ten broad, closely set, square-cut teeth (fig. 8). The *hectocotylus* was not present in the Challenger specimen, which was a female; but in some examples in the Copenhagen Museum, Professor Steenstrup pointed it out to me, as usual, on the left ventral arm; the distal suckers of the ventral series only are modified into conical papillæ, some of which bear a minute sucker at their tips (fig. 10). The *umbrella* is absent; the *buccal membrane* is well developed and has the usual seven points, each of which bears a few small suckers (occasionally only one). The *outer lip* is thick, thicker than the *inner;* both are cut up into papillæ along the edge.

[1] *Journ. de Conch.*, sér. 3, vol. xii. p. 25, 1872.

The Tentacles are as long as the head and body together, and have very slender, almost cylindrical *stems;* the *club* (figs. 11, 12) occupies about one-fourth of the whole length, and is but slightly expanded. The large central *suckers* are about eight in number and fully twice the diameter of the lateral ones; proximally to them are about half a dozen suckers of different sizes, and beyond them a large number of diminishing ones arranged in four series, and occupying nearly half the length of the club. The *horny ring* in the largest suckers bears about twenty-five square teeth (fig. 14); in the lateral suckers it bears more than twenty close-set acutely-pointed teeth (fig. 13), and in the distal ones about the same number of similar character (fig. 9).

The Surface is smooth.

The Colour is pale, with purplish chromatophores.

The Gladius (fig. 15) is of quite typical form, expanded behind, and about six times as long as broad; the narrow anterior extremity occupies less than one third the total length.

Dimensions.

Length, total,	182 mm.
End of body to mantle-margin,	68 „
End of body to eye,	75 „
Breadth of body,	18 „
Breadth of head,	15 „
Eye to edge of umbrella,	10 „
Length of fin,	40 „
Breadth of fin,	42 „
Breadth of each lobe,	16 „
Diameter of largest sucker on sessile arm,	1·8 „
Diameter of largest sucker on tentacle,	2 „

	Right.	Left.
Length of first arm,[1]	22 mm.	22 mm.
Length of second arm,	30 „	31 „
Length of third arm,	39 „	33 „[2]
Length of fourth arm,	35 „	32 „
Length of tentacle,	92 „	71 „

This specimen agrees so closely with several in the Copenhagen Museum that it is impossible to do otherwise than refer them to the same species. The two most prominent characters of this form are the presence of blunt teeth in the suckers, both in the tentacles and the sessile arms, and the type of the hectocotylisation; this consists in the modification of the suckers of *only one* series (that on the ventral aspect of the arms) into conical papillæ, the suckers persisting, although reduced in size, on the other.

This form, therefore, bears a curious relation to *Loligo bleekeri*, Keferstein, from the same region, in which the dorsal series is thus modified.[3]

[1] The lengths of the arms are measured from the oral margin.

[2] Mutilated.

[3] See Bronn, Klass. u. Ord. d. Thierreichs, Bd. iii., pl. cxxii. fig. 10.

It is clearly distinguished from that species, however, by the following characters :[1] (1) the length of the arms, which are about half the length of the body and not one-fifth, (2) the size of the tentacular suckers, which are much larger than those of the sessile arms, (3) the form of the gladius (compare fig. 15 with Keferstein's drawing),[2] and (4) the denticulation of the horny rings of the suckers.[3]

Loligo galatheæ, Steenstrup, MS. (Pl. XXVII.).

...	*Loligo galatheæ*,	Steenstrup, MS. in Mus. Havn.
1885.	„	„	Hoyle, Diagnoses II., p. 183.
1885.	„	„	Hoyle, Prelim. Rep. II., p. 286.

Habitat.—Station 203, off Panay, Philippine Islands, October 31, 1874 ; lat. 11° 6′ N., long. 123° 9′ E. ; 20 fathoms ; mud. Two immature specimens.

The Body is about four times as long as broad, cylindrical anteriorly, and pointed behind. The *fin* is rather less than half the length of the body, about as long as broad, and with rounded lateral angles. The *mantle-margin* curves out rapidly to a triangular process in the dorsal median line, for the rest it is almost transverse, except where it forms two obtuse angled processes, one at either side of the ventral emargination, which receives the siphon.

The Head is comparatively broad and with rather prominent rounded *eyes*. The *siphon* is moderately large and of the usual form.

The Arms are unequal, the order of length being 3, 2, 4, 1, and about half as long as the body. The dorsal have a distinct keel on the upper margin, the second are keeled on the ventro-lateral aspect, the third are stout and flattened and have a broad web on the outer aspect, which unites with the web running up the dorso-lateral aspect of the ventral arms. The *suckers* (fig. 2) are in two series throughout, with short peduncles, and not very oblique; their horny rings bear nearly twenty distant blunt teeth (figs. 3, 4). The left ventral arm is hectocotylised for about two-thirds of its length (fig. 5) ; there being as usual two rows of conical papillæ. The papillæ of the dorsal series are decidedly smaller than the others and bear each a minute sucker at the tip (fig. 6). Those of the ventral series are stouter and not so evenly conical as the others, tapering more rapidly towards their tips ; they bear also a somewhat elevated oval patch on one or both their sides, and a few of the proximal ones have each a small sucker at the tip (figs. 7, 8). At the base of the arm, lying transversely across it is an oval raised cushion with a rough papillate surface (fig. 5). The *umbrella* is absent. The *buccal membrane* has the usual seven points, each of which bears a few suckers. The *outer lip* is thin, the *inner* thin and papillate.

[1] Brock, *Zeitschr. f. wiss. Zool.*, Bd. xxxvi. p. 604, 1882.

[2] Bronn, *op. cit.*, pl. cxxvii. fig. 14.

[3] Compare Appellöf's figures (Japanska Ceph., pl. i. figs. 9, 10) with those given in the present Report.

The Tentacles are comparatively short, being not quite so long as the body; the *stems* are subtriangular. The *club* occupies less than one-third of the length, and has a protective membrane at either side of the suckers and a distinct web on the outer aspect. The large central *suckers* are eight to ten in number, and nearly twice the diameter of the lateral ones (fig. 9); the proximal group consists of about ten, while the distal portion bears four series of diminishing suckers. The *horny ring* bears long, distant, blunt pointed teeth, about twenty-four in the largest suckers (fig. 10), proportionally fewer in the smaller (fig. 11), which are much larger in the distal and external portions of the ring respectively.

The Surface is smooth.

The Colour is pale yellowish, spotted with brownish-purple and red chromatophores.

The Gladius (fig. 12) is of the usual form, the narrow anterior portion being comparatively broad and about one-fourth of the total length.

The description of this species given in the Preliminary Report has been modified in accordance with a drawing of an adult specimen in the Copenhagen Museum, which I received from Professor Steenstrup, and which is reproduced in Pl. XXVII.; the Challenger specimens were so small that it was not worth while to give dimensions of them.

Loligo (?) *ellipsura*, Hoyle (Pl. XXIV. figs. 1–6; Pl. XXV. figs. 11–15).

1885. *Loligo ellipsura*, Hoyle, Diagnoses, II., p. 182.
1885. „ „ Hoyle, Prelim. Rep. II., p. 285.

Habitat.—Station 313, off Cape Virgins, Patagonia, January 20, 1876; lat. 52° 20′ S., long. 67° 39′ W.; 55 fathoms; sand. One specimen, ♀.

The Body is elongated, widest anteriorly, and tapering gradually to an acute point behind. The *fin* is comparatively short, only one-third the length of the body, elliptical, slightly broader than long. The *mantle-margin* passes almost straight across the back, except where a long narrow median process juts out over the head (Pl. XXIV. fig. 2); it is slightly sinuate ventrally (fig. 1). The *siphon* is short and blunt.

The Head is short and very nearly as broad as the body; it has the usual auricular crest and pre-ocular pore.

The Arms are unequal, the order of length being 3, 4, 2, 1, and about one-third the length of the body; the first has a distinct web on its dorso-median angle, and the third a still broader web on its outer aspect, passing back nearly as far as the eye, where it becomes connected with another passing up the dorso-lateral aspect of the fourth. The *suckers* (figs. 4, 5) are in two series, pedunculate, oblique, notched distally, and somewhat larger on the lateral than on the other arms. The *horny ring* bears from five to seven

large pointed teeth in its distal portion, but is smooth proximally. The only specimen being a female the *hectocotylus* is not developed. The *buccal membrane* has the usual seven points, each of which carries two or three small suckers. The *outer lip* is thick and marked with radial grooves; the *inner* was not seen.

The Tentacle is slender, approximately cylindrical, and about two-thirds the length of the body; its terminal fourth is occupied by the *club* (Pl. XXV. fig. 11), which is but little expanded, and has a delicate protective membrane along either side of the inner surface and a well-marked web externally. The large median *suckers* (figs. 12, 13) are about ten in number, and about twice as large as the alternating lateral; the proximal are about twenty, and gradually increasing; the distal occupy nearly one half the club, and are in four series, diminishing. The *horny rings* of the largest suckers (fig. 14) have about twenty-four distant square pointed teeth, much longer on the distal margin; and are surrounded by a papillary area, consisting of two rows of plates succeeded by radial markings (Pl. XXIV. fig. 3); the lateral ones have about half as many similar teeth on the outer margin (fig. 6), and the terminal suckers are armed in the same way.

The Surface has been almost entirely denuded of skin.

The Colour appears to have been pale buff with purple chromatophores.

The Gladius (Pl. XXV. fig. 15) has the anterior narrow portion very long in comparison with the broader portion, but this is probably correlated with the small size and presumable immaturity of the specimen, for the posterior portion of the body grows more rapidly than the anterior (see p. 156).

Dimensions.

End of body to mantle-margin,	43 mm.
End of body to eye,	45 „
Breadth of body,	11 „
Breadth of head,	9 „
Eye to edge of umbrella,	5 „
Length of fin,	13 „
Breadth of fin,	18 „
Breadth of each lobe,	5 „

	Right.	Left.
Length of first arm,	14 mm.	15 mm.
Length of second arm,	17 „	17 „
Length of third arm,	18 „	20 „
Length of fourth arm,	16 „	16 „
Length of tentacle,	...	30 „

This species approaches *Loligo brasiliensis*, Blainville, in some respects; both have a rounded fin, although the shape is much more nearly elliptical in the present form, and both have blunt squarish teeth in the suckers of the arms and sharper ones in those of the tentacles; *Loligo ellipsura* has, however, only about five complete teeth in the arm-suckers and nineteen in the tentacular, whilst in *Loligo brasiliensis* the numbers are eight

and twenty-eight respectively, while the shapes are clearly distinct (compare d'Orbigny, Céph. acét., pl. xx. figs. 1–5).

It also resembles in its rounded fin *Lolliguncula brevis* (Blv.), but it differs from it in the greater slenderness of its body and correspondingly narrower fin, the teeth of the suckers too are different both in number and form; compare the figures here given with those of d'Orbigny, Céph. acét., pl. xxiv. figs. 14–19. Very probably it should be placed in the genus *Lolliguncula*, which is distinguished by the spermatophores being attached to a spot over the left gill in the female. The Challenger specimen bore no spermatophores, so that it is impossible to be certain of its true position. The male of *Lolliguncula brevis* has not yet been described.

Division II. ŒGOPSIDA, d'Orbigny.

Family X. Ommastrephini, Steenstrup.

Subfamily, Ommastrephidæ, Gill.

Ommastrephes, d'Orbigny.

Ommastrephes oualaniensis (Lesson), d'Orbigny.

1830. *Loligo oualaniensis*, Less., Voy. "Coquille," Zool., p. 240, pl. i. fig. 2.
1832. „ *vanicoriensis* Q. et G., Voy. "Astrolabe," t. ii. p. 79, pl. v. figs. 1, 2.
1832. „ *brevitentaculata*, Q. et G., *Ibid.*, p. 81.
1839. *Ommastrephes oualaniensis*, d'Orb., Cèph. acèt., p. 351; Calmars, pls. iii., xxi.; Ommast., pl. i. figs. 14, 15.
1862. „ *tryonii* (*?*), Gabb, Proc. Acad. Nat. Sci. Philad., p. 483, with plate.
1863. „ *ayresii* (*?*), Gabb, Carpenter, Rep. W. C. Moll., p. 613.
1880. *Ommatostrephes oualaniensis*, Stp., Ommat. Blækspr., pp. 76, 84, &c.

Habitat.—Between Api, New Hebrides, and Cape York, August 22, 1874. From the stomach of a specimen of *Sula piscator* which alighted on the ship. Eight specimens.

Pacific Ocean, 2½° north of the Admiralty Island, March 13, 1875; surface. One specimen.

Oualan Island (Lesson); Island of Vanikoro (Q. and G.); Pacific Ocean, "dans toute son étendue" (d'Orbigny); Indian Ocean, Cape of Good Hope (Tryon).

This species is readily distinguished from all others of the family in that the mantle has developed on either side an adhesion to the base of the siphon. The specimens were in bad condition and did not present any points worthy of special notice.

A young *Ommastrephes* of undetermined species was captured in the surface-net on April 29, 1876, which is interesting because, though only 5 mm. long, it showed the peculiar form of mantle-connective characteristic of the genus.

Todarodes, Steenstrup.

Todarodes pacificus, Steenstrup (Pl. XXVIII. figs. 1–5).

1880. *Todarodes pacificus*, Steenstrup, Ommat., Blackspr., pp. 83, 90, &c.
1886. *Ommastrephes pacificus*, Appellöf, Japanska Ceph., p. 35, pl. iii. figs. 8–10.

Habitat—Inland Sea, Japan; May 25 to 29, 1875. One immature specimen. Hakodadi, Japan (Steenstrup); Japan (Appellöf).

This species may be readily distinguished from *Todarodes sagittatus* (*Ommastrephes todarus*, d'Orb. et auctt.) by the following characters :—

1. The body is evenly cylindrical, and does not taper so rapidly posteriorly.

2. The tentacular suckers do not make their appearance until nearly halfway along the arm, whereas in *Todarodes sagittatus*, they begin close to the base.

3. The suckers of the sessile arms have subequal teeth (eight or nine in number) on the distal semi-circumference of the horny ring, while in *Todarodes sagittatus* there are seven teeth, of which the central one is much larger than the others.

The small specimen obtained by the Challenger had lost a good deal of its epidermis, but still it agreed very closely with the type specimens in the Copenhagen Museum, the chief differences being the greater relative shortness of the fin and of the tentacles, both of which may be referred to its immaturity. It was so small that a figure of it would have been of no service, and I am indebted to Professor Steenstrup for the drawings by Mr. Thornam, which are reproduced on Pl. XXVIII.

Tracheloteuthis, Steenstrup.

Verrilliola, Pfeffer.
Entomopsis, Rochebr. (?).

This genus has been described by its founder as follows :[1]—

"These forms have the eye furnished with a *sinus*. The siphon with a *valve*, the head with *aquiferous chambers* at the bases of the arms, but neither on the arms nor on the tentacles have they hooks instead of rings on the suckers, and hence, according to the present state of our knowledge, they must be classed among the Œgopsids beside *Ommatostrephes* and *Architeuthus*.

"The small specimens hitherto obtained, only 2 to 4 inches long, have many characters in common with *Architeuthus*—only two suspensory ligaments to the funnel, only a very long ridge on each side of the mantle and a trough- or groove-shaped hollow on either side of the siphon, together with relatively long tentacles, which have long clubs,

[1] *Vid. Meddel. nat. Foren. Kjøbenhavn*, p. 293, 1881.

whose proximal more slender portion is furnished with small closely placed suckers, while the distal part bears much larger ones.

"They are distinguished, on the contrary, by the much weaker musculature of the mantle (very little more powerful than in *Cranchia Reinhardtii*) and their more elongated form, more expanded fins one-third to one-fourth the length of the mantle, the great inequality in the length of the arms, and especially the preponderance of the lateral arms over both the ventral and dorsal, both in length and stoutness. When the mantle is divided along the ventral median line two peculiarities are observed: the position of the viscera in an aggregated mass far back in the mantle-cavity, with the rectum projecting from it, but so short that the anus with its two appendages lies about midway in the mantle-cavity and far from the base of the siphon; also the long and broad musculi depressores infundibuli, which extend backwards meeting in the middle line. The formula of the arms 2, 3, 4, 1.

"The *gladius* can be seen through the almost transparent, or at all events translucent mantle, in the form of a long, almost linear streak, until it approaches the base of the fins; here it expands into a broad lance-shaped blade, whose two margins bend over and form a hollow cone posteriorly. It closely resembles the figure of *Conoteuthis* given by d'Orbigny."[1]

Tracheloteuthis riisei, Steenstrup (Pl. XXVIII. figs. 6–12).

1881. *Tracheloteuthis Riisei*, Stp., Vid. Meddel. nat. Foren. Kjobenhavn, p. 294.
1884. *Verrilliola gracilis* (*?*), Pfr., Ceph. Hamb. Mus., p. 22, fig. 28.

Habitat.—Station 2, Færöe Channel, H.M.S. "Knight Errant" Expedition, July 28, 1880; lat. 60° 29′ N., long. 8° 19′ W.; surface. One specimen.

Atlantic, Mediterranean (Steenstrup); Solomon Islands (Pfeffer).

The Body is cylindrical in its anterior two-thirds and then tapers rapidly to a point. The *fin* is very little more than one-third the length of the body, and considerably broader than long; it is cordate in shape and is notched at its anterior insertion (fig. 6). The *mantle-margin* is transverse, slightly convex dorsally. The *mantle-connective* consists of an elongated cartilaginous groove and ridge in the nuchal region, and of a linear ridge on either side of the mantle fitting into a corresponding groove at the base of the *siphon;* which is short, subulate and deeply notched in the middle line behind (fig. 7). It is provided with a small valve; and has two long suspensory ligaments connecting it with the head. The furrow in which it lies is shallow.

The Head is narrower than the body except for the *eyes*, which in the present

[1] Moll. viv., pl. xxxii. figs. 1, 4.

specimen were globular and protruded from their sockets, so that the presence or absence of a sinus in the eyelid could not be determined.

The Arms are very unequal, the order of length being 2, 3, 4, 1; the longest are rather more than half the length of the body; the shortest about one-fifth. They are quadrilateral in section; the third pair bear a distinct but narrow web up the outer aspect and the fourth pair a keel on the dorso-lateral angle. There is no membrane bounding the sucker-bearing face. The *suckers* (fig. 8) are in two series throughout, and placed upon subulate conical peduncles, they are spheroidal and oblique and the *horny ring* bears in its distal semicircumference about eight or ten broad, square-cut teeth, standing close together. No trace of a *hectocotylus* was observed on the single specimen in the collection. The bases of the arms are not connected by any *umbrella*. The *buccal membrane* is thin, has seven blunt points, and is connected with the arms by ligaments in the usual way.

The Tentacles are about as long as the body and have slender subcylindrical *stems*. The *club* (fig. 9) is but slightly expanded, and has no protective membranes and no web. The wider portion is covered with about nine series of minute *suckers*, which have very long slender peduncles springing from a conical base and smooth *horny rings* (fig. 12). The narrow terminal part of the club bears about four series of much larger *suckers* (fig. 10), which are also mounted on large peduncles: their *horny ring* is armed in its distal semicircumference with about fourteen long acute teeth, and on its proximal margin with ten or twelve blunt quadrate teeth. The *suckers* at the extreme tip of the club resemble those last mentioned, but are smaller, and the proximal half of the *horny ring* is smooth (fig. 11). At the proximal end of the club the peduncles of the suckers become shorter till these are almost sessile. They extend for a considerable distance down the stem, but it was impossible to ascertain exactly how far. No fixing cushions could be seen, though their absence cannot be regarded as proved.

The Surface is smooth.

The Colour is white, probably transparent when alive, with elongated, reddish chromatophores here and there.

The Gladius was not extracted; it had been damaged near the anterior end of the fin, but it was possible to see that it forms a hollow cone posteriorly.

Dimensions.

Length, total,	67 mm.
End of body to mantle-margin,	32 ,,
End of body to eye,	35 ,,
Breadth of body,	8 ,,
Length of fin,	13 ,,
Breadth of fin,	19 ,,

	Right.	Left.
Length of first arm,[1]	8 mm.	8 mm.
Length of second arm,	18 „	...
Length of third arm,	...	15 „
Length of fourth arm,	13 „	13 „
Length of tentacle,	...	32 „

The specimen under consideration was only placed in my hands quite recently, so that I have not had the opportunity of comparing it with Professor Steenstrup's specimens; hence its identification cannot be regarded as certain, the more so as the original diagnosis of the species is very short, being in fact not a diagnosis but merely an indication of the characters which distinguish it from the only other form (*Tracheloteuthis behnii*) known to the author.

I cannot be sure of its identity with *Verrilliola gracilis*, Pfeffer; there are one or two points in his description which may indicate specific distinctness, but they seem to me unimportant.

Tracheloteuthis (*?*) sp. (Pl. XXXI. figs. 6–10).

Habitat.—South Pacific, November 5, 1875; surface at night. One specimen.

November 11, 1875; surface. Two specimens (stained with carmine and mounted in glycerine as microscopic objects).

Færöe Channel, August 8, 1882; surface. One specimen.

Pl. XXXI. figs. 6, 7 represents a young Cephalopod which I have been unable to refer to any species hitherto described, but it is so exceedingly immature that it would not be justifiable to make it the type of a new species, and I therefore content myself with publishing these drawings and a few remarks, in the hope that at some future time it may find its true systematic position.

The Facies of the specimen is exceedingly like that of a *Cranchia*, so that in my first examination of the Challenger material I referred it to that group without any hesitation; closer examination failed to disclose the three connections between the mantle and the head, even though in order to obtain complete certainty in this point I dismounted one specimen and made an incision down the ventral aspect of the mantle.

The Body is subcylindrical, elongated, and comparatively very large, presenting in this respect a marked contrast to *Loligo*, *Sepia*, and other forms whose young stages are well known. The *fins* are small and terminal, and so folded that their true shape is difficult to determine, but they appear each to have been transversely oval. The *mantle-cavity* is as large as in *Cranchia*, *Taonius* or *Tracheloteuthis*, and in the mounted specimens in which it has become apparently wider, owing to compression, the head at the end of a kind of stem projects from it like a clapper from a bell. The *siphon*

[1] Measured from the eye.

(Pl. XXXI. fig. 9) is short, entirely concealed within the mantle, and recurved, and at its base bears an elongated, oval, articular depression for articulation with the mantle, the corresponding part of which consists of a fine linear ridge, as in the Onychians, Taonoteuthids and *Tracheloteuthis;* it is connected with the head by two rudimentary but distinct ligaments, and has the prominent musculi depressores infundibuli which form such a striking character of the last mentioned form. I was unable to ascertain whether a valve is present. It agrees with *Tracheloteuthis* also in the posterior position of the viscera.

The Head is long, the *eyes* occupying the antero-inferior angles of it (fig. 8); the bright shining spherical lenses are clearly visible protruding from the body of the eye; over each eye is a chromatophore. The *mouth* is elevated on a process longer than the arms.

The Arms are quite rudimentary, the second pair being the longest, the others subequal; they bear one or two suckers.

The Tentacles are short and stout without distinct clubs, but with suckers in four rows at the extremities, and reaching down the greater part of the stem.

The Gladius extends the whole length of the mantle, and is linear, somewhat expanded behind.

Dimensions.

Length, total,	about 14 mm.
End of body to mantle-margin,	9 „
Breadth of body,	3 „
Breadth of head,	2 „
Length of tentacle,	about 3 „

Bathyteuthis, Hoyle.

Bathyteuthis, Hoyle, Narr. Chall. Exp., vol. i. p. 272, May 1885.
Benthoteuthis, Verrill, Third Catal., p. 401, July 1885.

Body long, cylindrical, tapering but slightly behind; *fins* subterminal, small and rounded; *mantle-connective* an elongated linear ridge fitting into a similar shorter groove on the base of the *siphon*, which is provided with a valve but has no dorsal bridles.

Head large, very broad, with prominent eyes.

Arms very short, slender and conical; *suckers* very minute and in two or four series. *Buccal membrane* large, with seven points, each bearing one or two suckers.

Tentacles long slender, without expanded clubs, but with numerous minute suckers.

Gladius resembling that of *Ommastrephes* in front but expanded in the posterior third.

Bathyteuthis abyssicola, Hoyle (Pl. XXIX. figs. 1–7).

1885. *Bathyteuthis abyssicola*, Hoyle, Narr. Chall. Exp., vol. i. p. 272, fig. 108.
1885. „ „ Hoyle, Prelim. Rep. II., p. 309, fig. 2.

Habitat.—Station 147, Southern Ocean, between Marion Island and the Crozets, December 30, 1873; lat. 46° 16′ S., long 48° 27′ E; 1600 fathoms; Diatom ooze. One specimen.

The Body is subcylindrical, somewhat narrowing towards and bluntly rounded at the posterior extremity. The *fins* are small, separate; each is somewhat rectangular in shape, with rounded angles, and attached to the body by one angle. The *mantle-margin* is almost transverse, but projects slightly in the dorsal median line, and forms a shallow sinus behind each eye and the siphon. The *mantle-connective* (fig. 2) consists of a long linear ridge, extending quite to the margin, and fitting into a corresponding, but somewhat shorter and broader, groove on the base of the *siphon*, which is short, tapering, and bluntly pointed, and fits into a shallow depression below the head, but has no dorsal bridles.

The Head is much broader than the body, being distended laterally by the enormous eyes, which look outwards and forwards, and have bright, prominent, glistening lenses.

The Arms (fig. 3) are unequal, the order of length being 4, 3, 2, 1, and about one-fourth the length of the body: they are all conical, and taper to slender points; each has a distinct angle along the outer side, which expands to a distinct web in the fourth pair; there is also a very narrow delicate web along each side of the sucker-bearing face. The *suckers* (fig. 4) are very minute, pedunculate, and are arranged in two irregular rows, almost embedded in the arm; they are spheroidal, the horny ring has five or six blunt-pointed teeth and is surrounded by two or three rows of conical papillæ. No *hectocotylisation* was observed in the specimen. The *buccal membrane* (fig. 3) is very large, has the usual seven points, connected by ligaments with the arms; each point bears one or two suckers.

The Tentacles are almost equal in length to the head and body together; the *stem* is very slender, cylindrical, and grooved along the inner aspect (fig. 5); they taper away rapidly towards the extremity, no *club* being formed: the *suckers* cover only the distal eighth of the tentacle in its inner aspect; they are smaller than those of the sessile arms, and almost imperceptible to the naked eye; they are urn-shaped, and have a smooth horny ring, surrounded by about two rows of very small papillæ (fig. 6).

The Surface is covered with minute wrinkles, probably due to the action of the spirit.

The Colour is a very deep purplish-brown.

The Gladius (fig. 7) was unfortunately somewhat damaged; for the anterior two-thirds it resembles that of an *Ommastrephes*, but posteriorly it expands into a broad blade resembling that of *Loligo;* although somewhat damaged during the extraction it was still

possible to ascertain that it does not form a terminal cone like that of *Ommastrephes* or *Taonius*.

Dimensions.

End of body to mantle-margin,	40 mm.
End of body to eye,	50 „
Breadth of body,	14 „
Breadth of head,	18 „
Eye to edge of umbrella,	10 „
Length of fin,	7 „
Breadth of fin,	16 „
Breadth of each lobe,	6 „

	Right.	Left.
Length of first arm,	16·5 mm.	16 mm.
Length of second arm,	16 „	16 „
Length of third arm,	15 „	15 „
Length of fourth arm,	15 „	15 „
Length of tentacle,	55 „	45 „

Notwithstanding the great distance between the localities where this species and Verrill's *Benthoteuthis megalops*[1] were captured, it seems quite possible that they may ultimately prove to be the same species. The chief differences seem to be the absence of the angular sinus in the eyelid in the Challenger specimen, the greater comparative size of the head, (though this may be explicable by the individual being smaller), and the suckers on the sessile arms being for the most part in two, not in four, series; but the two rows in the Challenger specimen are very irregular, and if but slightly more so might easily be regarded as four.

Verrill has called attention to certain embryonic characters in this genus, which are certainly very striking, namely, the size and position of the fins, the short arms, and more particularly the shape of the head, with the eyes situated at the anterior angles of a roughly quadrate mass.

The pen is very remarkable, exhibiting a combination of the characters of *Ommastrephes* and *Loligo;* I greatly regret that the posterior extremity was damaged in extracting it so that I have been unable to depict the extreme end on the plate; the dotted line indicates what seemed to have been the original form.

Certain other structural peculiarities of this animal seem to fit it for an abyssal existence; the small fins are in marked contrast to those of most pelagic species, although some genera which are characteristic surface forms such as *Cranchia* and *Idiosepius* have fins quite as small: the minute suckers and delicate tentacles appear but little fitted for raptorial purposes; while on the other hand the large circumoral membrane would seem well adapted for collecting nutritive matters from an oozy bottom.

It is uncertain to what family this form rightly belongs; it is possible that a new one will eventually be required for its reception.

[1] Third Catal., p. 402.

Subfamily Mastigoteuthidæ, Verrill.

Mastigoteuthis, Verrill.

Mastigoteuthis agassizii, Verrill (Pl. XXIX. figs. 8–10).

1881. *Mastigoteuthis Agassizii*, Vll., "Blake" Rep., p. 100, pls. i., ii. figs. 2, 3.
1881. „ „ Vll., Ceph. N. E. Amer., p. 297, pls. xlviii., xlix. figs. 2, 3.
1884. „ „ Vll., Second Catal., p. 243.

Habitat.—Station 2, south-west of Tenerife, Febuary 17, 1873; lat. 25° 52′ N., long. 19° 22′ W.; 1945 fathoms; Globigerina ooze. Fragments of a tentacle, found adhering to the dredge rope.

Off North Carolina, U.S.A; lat. 33½° to 34½° N., long. 75½° to 76° W., and 647 to 1632 fathoms (Verrill).

When these fragments were obtained Dr. von Willemoes-Suhm mounted several of the suckers as microscopic objects, and his diary has the following mention of the occurrence: "The arms of a cuttle-fish were brought up having suckers which show a horny denticulation of the finest arrangement. See preparations."

From these preparations the drawings on Pl. XXIX. have been made, which show the tentacular suckers to be hood-shaped, with a rather small aperture and a horny ring bearing from six to eight strong, pointed teeth, and surrounded by a broad papillary area, with two rows of spinous papillæ.

A thickened band of the horny material extends round the posterior and proximal part of the sucker, where it is visible through the integuments (fig. 9).

The fragments picked up by the Challenger have a combined length of 42 cm. or about one-third longer than the tentacle measured by Verrill.

The sucker-bearing portion is about 18·5 cm. long, and the greatest diameter (4 mm.) is about 7 cm. from the extremity; at the proximal part of the sucker-bearing portion the diameter has diminished to 3·5 mm. and a fragment which was apparently still nearer the base measures only 2·75 mm. From these dimensions it may be concluded that the specimen was of considerably greater magnitude than the larger of the two measured by Verrill, its total length from the posterior extremity to the end of the sessile arms having presumably been about 30 cm.

No portion of the present tentacle (of which the extreme tip has fortunately been preserved) is entirely surrounded by suckers, as Verrill indicates to have been the case with his examples, although his figure (*op. cit.*, pl. xlviii.) hardly agrees with this; and at the widest portion of the tentacle almost exactly half its circumference is covered by suckers.

This difference, and also the fact that the tentacle instead of tapering gradually

throughout its whole length as stated by Verrill, is distinctly thickened in the middle of the club may indicate specific or varietal distinctness, but with our present knowledge it would be very undesirable to give this formal expression.

Family XI. Onychii, Steenstrup.

Subfamily Onychoteuthidæ, Gray.

Enoploteuthis, d'Orbigny.

Enoploteuthis margaritifera, Rüppell (Pl. XXIX. fig. 11).

1844.	*Enoploteuthis margaritifera*,	Rüppell., Giorn. Gab. Messina, t. xxvi. p. 2, fig. 1.
1851.	„	„	Vér., Céph. médit., p. 82, pl. xxx. fig. a.
1858.	„	„	Claus, Archiv f. Naturgesch., Jahrg. xxiv., Bd. i. p. 262, Taf. x. fig. 2.
1879.	„	„	Tryon, Man. Conch., vol. i. p. 172.

Habitat.—Station 195, off Amboina, October 3, 1874; lat. 4° 21′ S., long. 129° 7′ E.; 1425 fathoms; blue mud. One specimen.

Station 271, Central Pacific, September 6, 1875; lat. 0° 33′ S., long. 151° 34′ W.; 2425 fathoms; Globigerina ooze. One specimen.

Mediterranean (Rüppell, Vérany, Claus).

These two specimens were found at localities widely separate from each other, and from the original habitat of the species, but still they exhibit no characters which would justify their separation. The specimen from the Central Pacific does not possess the round spots under the eye from which the specific name is derived, but since these are invisible below one eye of the other individual, and indistinct below the other, I do not think that much stress can be laid upon this.

The number of hooks upon the tentacular arms appears to vary between three and four; and the body is more slender and the fin more rounded than in Vérany's figure, approximating to that of Claus (*loc. cit.*).

Tryon's account of this species (*loc. cit.*) contains a mistake which can only be the result of his having translated Vérany without taking the trouble to read the context. He says "distinguished . . . . by the sessile arms having two rows of cups and one of hooks." It is true this is an exact rendering of Vérany (*op. cit.* p. 83), but if Mr. Tryon had reflected upon this statement for a moment, he would have perceived that an animal with such a character could not possibly belong to the genus *Enoploteuthis*, and if he had taken the trouble to read Vérany's description on the preceding page he would have seen the sessile arms described thus: "Tous ces bras sont armés d'une double rangée de tubercules charnus, enveloppant une griffe;" while the tentacles are described as "terminiés

par une massue lanceolée, armée d'une double rangée de très petites cupules sessiles, dont les plus grosses sont celles de la base, et d'une rangée latérale de quatre griffes." The conclusion from which is unavoidable, that in the passage translated there is a misprint or *lapsus calami* of "sessiles" for "tentaculaires."

Whence Tryon's statement (*loc. cit.*) that there are "two specimens only known" is derived I cannot say; Gray[1] mentions the existence of two examples in the British Museum (which are still preserved) presented to him by Rüppell, who probably did not part with the whole of his collection.

Tryon's definition of the genus *Enoploteuthis* (*op. cit.* p. 107) is inaccurate; the phrase "tentacles with hooks only" is contradicted by the figure he himself gives (pl. lxxv. fig. 317, copied from Vérany) of the tentacle of this very form. Vérany's figure is, however, not very accurate, and I have therefore given one taken from the specimen from Amboina (fig. 11); this shows the proximal group of suckers not only to be much larger than indicated in the above-mentioned drawing, but to consist partly of suckers and partly of fixing cushions ("Hæftepuder," Steenstrup). The hooks vary in number between three and four; the club from which the drawing was made had only two, but as there was a vacant space from which it had evidently fallen out I have supplied the deficiency.

Onychoteuthis, Lichtenstein.

Onychoteuthis, sp.

Habitat.—Off Valparaiso, October 21, 1875, between the surface and 30 fathoms; and North Atlantic, April 12, 1876; surface. Too young and ill preserved for determination.

Teleoteuthis, Verrill.

Onychia, Lesueur.
Onychoteuthis, Auctt. (*pars*).

Teleoteuthis caribbæa (Lesueur), Verrill (Pl. XXX. figs. 1–8).

1821. *Onykia carribæa*, Les., Journ. Acad. Nat. Sci. Philad., vol. ii. p. 98, pl. ix. fig. 1, 2 *a–e*.
1836. *Loligo laticeps*, Owen, Trans. Zool. Soc. Lond., vol. ii. p. 108, pl. xxi. figs. 6–11.
1837. *Cranchia perlucida*, Rang, Mag. de Zool., pl. xciv.
1839. *Onychoteuthis cardioptera*, d'Orb., Céph. acét., p. 333; Cranchies, pl. iv.; Onychot., pl. v. figs. 4–6 (*pars?*).
1849. *Onychia cardioptera*, Gray, B.M.C., p. 57.
1851. *Loligo alessandrinii* (*?*), Vér., Céph. médit., p. 99, pl. xxxv. figs., f. g. h.
1880. *Onychia caribæa*, Stp., Ommat. Blækspr., p. 96.
1882. *Teleoteuthis carribæa*, Vll., Ceph. N. E. Omer. (Fish Comm. Rep.), p. 70.

Habitat.—North Atlantic, between St. Thomas, West Indies, and Bermuda; surface. Three specimens.

[1] B. M. C., p. 48.

?North Pacific, off Volcano Island, April 3, 1875; about lat. 24° 49′ N., long. 138° 34′ E.; surface. Three specimens.

?North Pacific, near the same locality, April 5, 1875; surface. One specimen.

Gulf of Mexico, Gulf Stream, "amongst fuci" (Lesueur), North Atlantic, surface (Owen), Atlantic Ocean (d'Orbigny, Steenstrup).

The specimens marked with a query are small and badly preserved, so that their identification is by no means certain; some doubt is also thrown upon it by the fact that the species has not hitherto been found except in the Atlantic, but in a creature of such pronounced pelagic habit much stress need not be laid upon this.

Owen's figure of the whole animal is very good, but no satisfactory drawing of the club appears yet to have been published, so I give one of it.

The tentacular club (fig. 1) is only slightly expanded, but has a broad web along its distal half. On the proximal portion ("wrist" of various authors) it bears a group of seven to nine suckers, and the same number of fixing cushions, beyond which are four series of hooks and suckers, the latter being situated along the margins, the former in the centre. The first transverse row contains suckers only, the second has two suckers outside, and between them two whose horny ring shows an early stage of hook formation (fig. 4). The hook becomes gradually more prominent (fig. 5), and is best marked in the sixth and seventh rows, where they have the form shown in the drawings (figs. 6, 7). The muscular part entirely covers the horny part of the hook in all those specimens, even the point being protected by a sort of membranous hood (fig. 7), but by mounting in Canada balsam they become quite transparent, and the outline of the hook itself shows clearly through.

There are about eight rows of hooks, beyond which the club bears three (or four?) irregular rows of minute suckers (fig. 3), whose horny ring bears five long acute teeth. The large marginal suckers (fig. 2), have four or five long pointed teeth, and a papillary area with two rows of spinous papillæ. In the specimen figured the flexible floor of the sucker intrudes very far into its cavity.

Subfamily Gonatidæ, nov.

Gonatus, Gray, 1879.

Sepia loligo, Fabricius.
Onychoteuthis, Lichtenstein, Møller, Middendorff.
Owenia, Prosch (*pars*).
Lestoteuthis, Verrill (*pars*).
Cheloteuthis, Verrill.

Gonatus fabricii (Lichtenstein), Steenstrup.

1780. *Sepia loligo*, Fabr., Faun. grœnl., p. 358.
1818. *Onychoteuthis fabricii*, Licht., Sepien mit Krallen, p. 13.
1842. „ „ Møller, Ind. Moll. grœnl., p. 3.
1842. „ (?) *amœna*, Møller, *Ibid.*, p. 3.
1849. „ *kamtschatica*, Middff., Mém. Acad. Sci. St. Petersb., sér. 6, t. vi. p. 515, pl. xii. figs. 1–6.
1849. *Gonatus amœna*, Gray, B.M.C., p. 68.
1858. *Gonatus amœna*, Adams, Gen. Rec. Moll., p. 36, pl. iv. fig. 2.
1876. *Leachia borealis*, Jeffreys, Proc. Roy. Soc. Lond., vol. xxv. p. 180 (*err.*).
1876. „ *hyperborea*, Jeffreys, *Ibid.*, p. 193 (*pars*).
1878. *Gonatus amœnus*, Sars, Moll. Reg. Arct. Norv., p. 336, tab. xxxi.
1880. *Lestoteuthis kamtschatica*, Vll., Ceph. N. E. Amer., p. 251.
1880. *Gonatus fabricii*, Stp., Sthenoteuthis og Lestoteuthis, p. 9, pl. i.
1881. „ „ Vll., Ceph. N. E. Amer., p. 291, pl. xlv. figs. 1, 2.
1881. *Cheloteuthis rapax*, Vll., *Ibid.*, p. 293, pl. xlix. fig. 1.
1881. *Lestoteuthis fabricii*, Vll., *Ibid.*, pp. 387–393, pl. xlv. figs. 1, 2; pl. xlix. fig. 1; pl. lv. fig. 1.
1882. *Gonatus fabricii*, Stp., Notæ Teuthol. I., p. 143.

Habitat.—Lat. 58° 45′ N., long. 48° 39′ W., August 15, 1875. Taken by the tow-net during the cruise of H.M.S. "Valorous." Two young specimens.

Lat. 59° 16′ N., long. 37° 16′ W. Washed on board H.M.S. "Valorous" during a gale.[1]

Whole of Davies Strait, south and east of Greenland, lat. 58° to 61° N., long. 16° 52′ W.; Iceland; Færös, Atlantic, deep water; Mediterranean; South of Cape of Good Hope, lat. 40° S., long. 15° 18′ E. (Steenstrup); Porsangerfjord, Norway; Coast of Finmark, Norway (Sars); Kamtschatka (Middendorff); Japan (Steenstrup, Leiden Museum); Seal Island, Nova Scotia, from the stomach of a cod (Verrill); one hundred miles south of Newport, R.I., from the stomach of a fish (Verrill).

This remarkable form has received perhaps more maltreatment at the hands of teuthologists than any other of its class, as will appear from the above extensive synonymy. The most complete and reliable information we possess regarding it is in Professor Steenstrup's papers, but as these have by no means received the attention they deserved, owing probably to their having appeared in the Danish language, I shall make no apology for reproducing considerable portions of them here.

The genus *Gonatus* is defined as differing from all others of the same group in the following characters:[2]—

[1] This is the specimen alluded to by Dr. Gwyn Jeffreys in the "Valorous" Report (*loc. cit. supra*); he is mistaken, however, in stating that it was the same species as that obtained during the first cruise of H.M.S. "Porcupine," that being *Taonius hyperboreus* (see p. 191). The label on the bottle bears the name "*Leachia ellipsoptera*," written in pencil and almost erased.

[2] Sthenoteuthis og Lestoteuthis, p. 10.

1. *The Arms* have each four series of suckers or hooks, whilst all other Œgopsids have only two.
2. *The Ventral Arms* possess only suckers in all the four series, whilst the other arms have two series of suckers along the margins, and two series of hooks up the centre; a variation in the armature which is hitherto known in no other Enoploteuthid nor indeed in any Onychian at all.
3. *The Tentacles* are furnished even from a point low down upon the stem with regularly disposed longitudinal series of small suckers and corresponding fixing-cushions, which allow of the tentacles being attached throughout almost their whole length, an arrangement seen in no other Onychian.
4. *The Connective Apparatus* is continued up one side of the club, where it forms a group of five or six large suckers and fixing cushions, whilst the middle of the club itself is occupied by a very short series of two large and three very small hooks, and the elongated tip of the club is covered with small suckers. The club itself has no connective apparatus such as is seen in most Onychians.
5. *The Gladius* is narrow and linear anteriorly, but broader and lanceolate in the hinder two-thirds, whilst it ends posteriorly in a hollow cup or cone, which has several diaphragms within it, and is not covered outside and behind by a solid chitinous spine as is the case with most, perhaps all, Onychoteuthids and Enoploteuthids; at all events no species hitherto known has such a hollow cone.
6. *The Fins* reach some distance beyond the hinder end of the body, and their firm saddle-shaped cartilage slides upon the terminal portion of the gladius.
7. *The Radula* has only five rows of teeth, instead of the usual seven.

Such a combination of characters renders the creature easy to distinguish from all other forms, but if one of them be overlooked, as may readily happen on superficial examination, misunderstandings regarding it are sure to arise, and this has continually happened during the history of the species. For instance, Møller[1] failed to recognise his specimens of *Onychoteuthis* (*?*) *amœna*, some two inches long, as the young of the *Sepia loligo* of Fabricius,[2] which were two or three times as large.

The latter author gave a very accurate description of the species, and it is greatly to be regretted that he did not take an opportunity of comparing it with a specimen of the true *Sepia loligo*, Linn., for he would at once have recognised its distinctness and have given it a name which would have obtained currency; one consolation in this regard must be the fact that Lichtenstein gave the form its discoverer's name, which it still bears.

Gray received some specimens of this type from Møller and founded upon them the

[1] Ind. Moll. grœnl., p. 3.

[2] Faun. grœnl., p. 358.

genus *Gonatus*, not, however, without making several mistakes, which have since led to great confusion. Steenstrup has tabulated the most serious of these as follows:—

a. Gray overlooked the difference between the armature of the ventral and of the other arms, not seeing the tips of the hooks in the two median series of suckers, as his description "all with small circular rings"[1] proves; the same error reappears in the phrase "and the outer series of the cups on the shorter arms are like the other, with circular arms and no hooks."[2] Møller had rightly observed that the horny rings had often a very small hook on the margin, but thought, wrongly, that they had fallen out or were lost in those cases in which he did not see them ("uncinis marginalibus minutissimis et admodum caducis [rarissime obviis] instructis").[3]

b. Gray denied the presence of the minute suckers along the stems of the tentacles which Møller had correctly observed and recorded ("brachiis pedunculatis per totam longitudinem cotylis præditis"), whilst Gray in his turn perceived the hooks in the tentacular clubs whose existence Møller regarded as doubtful. ("Uncinos in brachiis ped. nondum vidi; fortasse tamen adsunt, sed æque caduci ac uncini brachiorum sessilium.")

c. Gray states that the siphon has "no interior valve," and that it is "without superior central band"; and

d. That the gladius has no terminal cup, although in other respects his description of it is correct.

Nothing was added to our knowledge of this form between 1849 and 1878, when Professor G. O. Sars published[4] some figures and a description of a small specimen captured in the Porsangerfjord, concerning which Steenstrup makes the following criticisms:[5]—

"In the enlarged details of portions of an arm, and of suckers from the median and lateral series, any one who is acquainted with *Gonatus* will readily recognise its characters, and will also see in fig. 10 an approximate though not quite accurate representation of its tentacles. The same holds of fig. 11, which represents the most important middle portion of a tentacular club, except that the connective apparatus is omitted both in the drawing[6] and in the text. As regards the gladius, the ventral aspect of which is shown in fig. 4, its terminal cone has been laid open in the middle line and spread out on either side, instead of being retained in its proper conical shape with which agrees also the expression in the text 'extremitate postico leviter cochleariformi.'

[1] B. M. C., p. 67. [2] *Op. cit.*, p. 68. [3] Ind. Moll. grœnl., p. 3.
[4] Moll. Reg. Arct. Norv., p. 336, tab. xxxi. [5] *Op. cit.*, p. 14.
[6] There are a number of minute dots along the arm which seem to me as though intended to suggest the presence of minute suckers.—W. E. H.

"The additions which must be made to Sars' description are in the direction of further detail, for the expressions used in characterising the structure of the arms and tentacles of this remarkable form are too general and undecided. It is not mentioned that the median suckers on three pairs of arms bear true hooks, nor that in this respect the ventral arms differ from the others, nor that the tentacles are provided with a connective apparatus both on the stem and on the club. Nevertheless, figs. 10, 11 leave no doubt that they were drawings from a *Gonatus* whose characters were not sharply perceived, while fig. 5, part of an arm with its four series of suckers, figs. 6, 7, 8, a sucker from the middle, and fig. 9, one from the lateral series, show clearly that there were two series of hooks and two of true suckers."

In 1880, Professor Verrill,[1] misled no doubt by Gray's errors and Sars' omissions, made *Onychoteuthis kamtschatica*, Middendorff, the type of a separate genus under the name *Lestoteuthis*, without recognising its identity with *Gonatus*, including also in it Dall's *Onychoteuthis robusta* (since made the type of a genus *Moroteuthis*, and since shown by Steenstrup to belong to *Ancistroteuthis*). Verrill's paper was followed by that of Steenstrup,[2] from which the above quotations have been made, but whilst it was passing through the press Verrill published the second part of his monograph,[3] in which he described a specimen of *Gonatus fabricii*, taken from the stomach of a cod, but still without recognising it as identical with *Onychoteuthis kamtschatica*, Middendorff (his *Lestoteuthis*), and in his Report on the "Blake" Cephalopods, 1881, published the genus *Cheloteuthis*, which, however, he speedily abandoned as synonymous with *Lestoteuthis*.[4]

In the appendix to his Monograph,[5] Verrill introduces another Cephalopod from Cumberland Gulf, which is said to have "four rows of true suckers on all the arms, and no hooks." This he is disposed, still misled by Gray's inaccurate description, to regard as doubtless "the *real Gonatus amœnus*, Gray." Steenstrup in a second paper[6] has pointed out the untenability of this view, and having recently examined Gray's types of *Gonatus amœnus* in the British Museum, I can quite corroborate all his statements regarding their absolute identity with *Gonatus fabricii*. What this Cumberland Gulf specimen really was has never transpired, as no further information about it has been published, but seeing the ease with which the hooks of *Gonatus* are overlooked, it is not impossible that it may also be referable to that genus.

Owenia, Prosch, which appears in the list of generic synonyms above, demands merely a few words of explanation; the Danish naturalist received along with his *Cranchia megalops* some small Cephalopods, which he wrongly regarded as being identical with it, and he was induced to separate his new species as a subgenus of *Cranchia* owing to the mantle not being directly continuous with the head dorsally, a character

[1] Ceph. N. E. Amer., p. 250.
[2] Sthenoteuthis og Lestoteuthis.
[3] Ceph. N. E. Amer., pp. 259–446.
[4] *Op. cit.*, p. 388.
[5] *Op. cit.*, p. 188.
[6] Notæ Teuthol., I.

found only in the wrongly identified specimens, which were afterwards shown by Steenstrup to be small specimens of *Gonatus fabricii*, so that the subgenus *Owenia* lost all *locus standi*.

The result of all this is a list of synonyms anything but pleasant to contemplate, but since the publication of the excellent plate in Steenstrup's first mentioned paper it will be difficult for any observer to mistake this form in the future.

The specimens which have come into my hands from the "Valorous" expedition are all small and have not enabled me to add anything of consequence to the descriptions which have gone before, but it appeared worth while to make their occurrence in the collection an opportunity for giving a resumé of the literature regarding this interesting form.

Family XII. Taonoteuthi, Steenstrup.

Subfamily Chiroteuthidæ, Gray.

Chiroteuthis, d'Orbigny.

Chiroteuthis (*?*), sp. (Pl. XXXI. figs. 1–5).

Habitat.—Pacific Ocean. Fragments of a gladius taken from the stomach of a shark, September 2, 1875.

One of the most curious specimens in the collection is this much damaged and fragmentary pen, for if I am correct in referring it to *Chiroteuthis*, that genus must attain dimensions which have been hitherto quite unsuspected.

The portions preserved are ten in number, of which three are mere scraps and give no information regarding the form of the complete structure. The largest piece is 22·5 cm. in length; with a maximum and minimum depth of 2 cm. and 1·5 cm. respectively, while the breadth varies from 0·85 to 1 cm. The form of its section at the larger and presumably the anterior end is shown in fig. 3: it is in fact a lamella, thickest in the mid-dorsal line where it is sharply folded to form a keel, thence it passes in two curves (like ∽∽) outwards, then downwards, and finally inwards towards the median line again. Whether the margins of the lamellæ were fused at this point, as will be seen to be the case in the posterior portion, cannot now be decided, but as in the majority of pens the anterior portion is flat and open, there is no reason for doubting that this was the portion where the opening began to take place.

The smaller extremity of the fragment in question has a section of the form shown in fig. 4, which was drawn, however, from a portion situated slightly farther back; it closely

resembles the other end, but the lamina is here thicker, and the ventral margins have fused, forming a closed quadrangular tube.

The next portion is quite similar in form, and from a consideration of its breadth and depth must have been situated posteriorly to the largest piece, and separated from it by a distance of 2 or 3 cm.; it measures 5 cm. in length. The next piece is 6·5 cm. long, and evidently fitted closely to the one just mentioned; this appears to have been followed by a piece 6 cm. long, separated from it by about 1 cm., and finally there is a portion 8·5 cm. long succeeding to this, but separated from it by about 5 cm. All these portions resemble the first in the form of their transverse section, and taper gradually backwards, so that the posterior extremity of the last has a depth of 6 mm. and a breadth of 4·5 mm., as shown in fig. 5. This termination is, however, roughly truncated, and was evidently not the end in the natural condition; it probably came to a point as in most other forms.

In addition to all these there is a long strip 26·5 cm. in length which consists almost entirely of the dorsal keel, which is here larger than in the portion first mentioned, and it is slightly larger at one extremity than the other. The smaller end was presumably separated by an interspace of unknown length, from the part shown in fig. 1, and on one side it bears a piece of the lamina, 6 cm. in length, 2·5 cm. in breadth posteriorly, and tapering to a point anteriorly (see fig. 2); the margin is perfectly smooth and even, so that this was evidently the anterior part of the expanded lamina or blade of the pen.

The anterior extremity of the keel (fig. 4*a*) is 5 mm. high, 3 mm. broad at the top, and 6 mm. at the base; it is irregularly truncated, so that it evidently did not form the anterior extremity, and its lateral margins are also rough, so that its breadth was originally somewhat greater than at present.

Unfortunately it is impossible to give even a probable estimate of the total length of the pen; all the fragments and the interspaces which can be calculated with some degree of certainty amount together to 78 cm., so that we have here a minimum; but what was the length of the flat expanded portion of the blade, or whether indeed any portion was actually widely spread out, there are no means of ascertaining.

The only structure known to me with which this pen can be at all compared is that of *Chiroteuthis lacertosa*, as described by Verrill, but to this the resemblance is apparently rather close. In both there is a narrow anterior portion, with a keel of very similar form (compare his figure, pl. lvi. fig. 1*a*′ with Pl. XXXI. fig. 4*a*). The correspondence between his figure 1*a*″ and fig. 3 is so close as to strike any one who places them side by side. The likeness is, I think, sufficient to prove that the forms belong at any rate to closely allied genera.

Professor Steenstrup has also told me that the specimen of *Doratopsis vermicularis*, in the Copenhagen Museum, has a pen somewhat resembling this, but as I did not see that specimen during my visit I can give no particulars regarding the comparison; it will be described and figured, however, in one of his forthcoming papers.

Histiopsis,[1] Hoyle.

Body resembling *Calliteuthis*, Verrill, in shape and in the pigment spots scattered over it. *Siphon* with a suspensory ligament and a valve.

Head large and broad; *eyes* very large.

Arms webbed to some extent between the dorsal, dorso-lateral, and lateral pairs. *Suckers* small in two series.

Tentacles truncated in the only known specimen.

Gladius resembing that of *Loligo*, but short and broad.

This genus is erected for a unique specimen which was brought up by the trawl in the middle of the South Atlantic; as will appear in the sequel it presents characters which show it to occupy a position intermediate between *Calliteuthis* and *Histioteuthis*.

Histiopsis atlantica, Hoyle (Pl. XXX. figs. 9–15).

1885. *Histiopsis atlantica*, Hoyle, in Narr. Chall. Exp., vol. i. p. 273 (*nomen tantum*).
1885. „ „ Hoyle, Diagnoses II., p. 201.
1885. „ „ Hoyle, Prelim. Rep. II., p. 306.

Habitat.—Station 333, Mid-South Atlantic, March 13, 1876; lat. 35° 36′ S., long. 21° 12′ W.; 2025 fathoms; Globigerina ooze. One specimen, ♂.

The Body is short and conical; acuminate and curving gently downwards posteriorly. The *fin* is about one-third the length of the body and considerably broader than long; each half is roughly semicircular and narrows into its insertion both in front and behind. The *mantle-margin* is in general transverse, but projects slightly as a blunt rounded angle in the dorsal median line. The *mantle-connective* consists of a groove with a narrow median fillet in the mid-dorsal line fitting into a corresponding cartilaginous surface on the back of the neck, and of a long linear ridge extending up to the margin, which fits into a shorter groove on the base of the *siphon;* this is broad, short, and conical, has a thick suspensory ligament, through the skin of which two muscles may be distinguished, and a distinct valve.

The Head is as large as the body, rounded at the sides, and flattened above and below. The *eyes* appear to have been enormous, one is distended and protrudes from its orbit, whilst the other is shrivelled (fig. 9). There is no auricular crest nor preocular pore, but behind each eye is a white papilla.

The Arms are about equal in length to the head and body together; the dorsal are

[1] Contracted from "*Histioteuthopsis.*" There being only one species the generic diagnosis is of course merely provisional.

the shortest, the other three pairs subequal, the order of length being 3, 4, 2, 1; they are quadrilateral, with rounded angles externally, with two slightly raised ridges internally, on which the suckers are situated; they taper gradually to very slender tips; the third pair have a delicate narrow web along the third quarter of their outer aspect. The *suckers* are in two series throughout; they are small and distant along the proximal third (the webbed portion) of the arms, then larger and closer, and finally minute and very closely set towards the tips; they are set transversely on short conical peduncles, spheroidal, with a swollen band round the face. The *horny ring* (figs. 12, 13) is smooth proximally, distally it bears about five close-set, broad, bluntly rounded teeth; the smaller proximal suckers have a smooth ring (fig. 14). No trace of *hectocotylisation* could be found on any of the arms. The *umbrella* is found only between the dorsal, dorso-lateral, and lateral arms; it takes origin from the sucker-bearing ridge and extends about one-third up the arm. The *buccal membrane* (fig. 11) is broad and somewhat contracted over the mouth; it has the usual seven points, but they are very blunt and indistinct; it is united by three ligaments with the web between the dorsal and dorso-lateral arms, by a ligament with the inner side of each ventro-lateral arm on its ventral aspect, and by another to the inner surface of each ventral arm, there being altogether seven ligaments. The membrane bears no suckers; its inner surface is much creased and folded. The *outer lip* is very thin and smooth, and hidden between the creased integument of the buccal membrane and the *inner lip*, which is thick and marked with irregular radial grooves.

The Tentacles have been removed; the stumps which remain are not half the length of the arms; they are quadrangular and flattened from above downwards.

The Surface bears a large number of papillæ, slightly elevated, resembling those of *Calliteuthis;* they are arranged most thickly on the ventral aspect of the head and body, but there are also a few on the dorsal surface; they extend up the outer aspect of the arms, three series on the ventral arms, two on each of the others. Near the tip of each dorsal arm is a series of four or five black, elongate, egg-shaped swellings, gradually diminishing in size, and forming apparently an extreme development of the papillæ above mentioned. The second pair of arms appears to have been similarly provided; the third has been so stripped of integument towards the tips that it is impossible to ascertain the original condition. In the fourth the warts at the tip are quite similar to those lower down the arm.

The Colour is a dull purplish-madder, paler above than below, the papillæ are a deep black, with a white centre, usually situated towards the anterior margin. The *buccal membrane*, both sides of the umbrella, and the inner surfaces of the arms, so far as this extends, are a deep purple.

The Gladius (fig. 15) resembles that of *Loligo*, the anterior portion forming about one-fourth the total length.

Dimensions.

Length, total,	96 mm.
End of body to mantle-margin, ventrally,	25 „
End of body to mantle-margin, dorsally,	35 „
End of body to eye,	40 „
Breadth of body,	22 „
Breadth of head,	22 (?) „
Eye to edge of umbrella,	12 „
Length of fin,	15 „
Breadth of fin,	21 „
Diameter of largest sucker on sessile arm,	1 „
Diameter of eye,	15 „
Diameter of lens,	7 „

	Right.	Left.
Length of first arm,[1]	45 mm.	47 mm.
Length of second arm,	51 „	56 „
Length of third arm,	55 „	55 „
Length of fourth arm,	50 „	50 „

This form is evidently related both to *Histioteuthis* and to *Calliteuthis*, and in many respects is intermediate between them. For instance, while *Histioteuthis* has a large web, and *Calliteuthis* none, *Histiopsis* has a web which reaches about halfway up the arms. The dorsal bands of the siphon are present in *Histioteuthis*, present in *Calliteuthis*, whilst in *Histiopsis* they are present but concealed, and not obvious except on close examination.

As regards the presence of a valve in the siphon of these forms there seems to be some uncertainty; d'Orbigny[2] united the genera *Loligopsis*, *Chiroteuthis*, and *Histioteuthis* in the family Loligopsidæ, which had, amongst other characters, that of being destitute of a siphonal valve. The first of these genera, as has been already pointed out (p. 46), has no systematic *locus standi* whatever; *Histioteuthis* is usually described as having no valve, as is also *Chiroteuthis* by Vérany,[3] d'Orbigny and Brock,[4] whilst Verrill in a species described by him from the North Atlantic, which certainly seems to belong to this genus, distinctly affirms that a valve is present. Professor Lankester informs me that in a *Chiroteuthis veranyi* in University College Museum, London, "there is a very small, in fact, a rudimentary valve, just a transverse fold not projecting much" and also that he has acquired a *Histioteuthis* with a "well-developed valve in its funnel." From this it seems certain either that an error has been made by some observer or else that one species of *Chiroteuthis* has a siphonal valve, whilst others have not, which would imply that the systematic value of this structure is very much less than has hitherto been supposed, for its presence or absence has generally been considered as

[1] Measured from the centre of the eye.

[2] Céph. acét., p. 320.

[3] Céph. médit., p. 120.

[4] Morphol. Jahrb., Bd. vi. p. 261, 1880.

constant within the limits of the same family. Perhaps the readiest explanation is that the valve being very small, Vérany and others have overlooked it in *Chiroteuthis;* but it seems at present impossible to explain the discrepancy regarding *Histioteuthis.*

It seems advisable provisionally to rank the present form in the same family with *Calliteuthis* and *Histioteuthis,* to which it is certainly allied, under the name Chiroteuthidæ, Gray; which will be equivalent to d'Orbigny's Loligopsidæ without its type-genus, and which seems to be uncertain in respect of the presence of a siphonal valve.

Verrill has proposed [1] a new family, Histioteuthidæ, but in our present lack of knowledge on many points connected with these interesting forms the step seems to me hardly justified, especially in view of the existence of a genus so clearly intermediate between the two principal genera as the present.

Calliteuthis, Verrill.

Loligopsis, Owen (*pars*).

Calliteuthis reversa, Verrill (Pl. XXXIII. figs. 12–15).

1880. *Calliteuthis reversa,* Vll., Amer. Journ. Sci. and Arts, vol. xx. p. 393.
1881. „ „ Vll., Ceph. N. E. Amer., p. 295, pl. xlvi. fig. 1.
1884. „ „ Vll., Second Catal., p. 243.

Habitat.—Station 168, east of the North Island, New Zealand, July 8, 1874; lat. 40° 28′ S., long. 177° 43′ E.; 1100 fathoms; blue mud. One immature specimen taken at the surface.

Station 232.—The *Hyalonema* ground off Ino Sima Island, Japan, May 12, 1875; lat. 35° 11′ N., long. 139° 28′ E.; 345 fathoms; green mud. One specimen.

Several stations off the eastern United States, depths 1000 to 3000 fathoms (Verrill).

Verrill's admirable description and figures leave no room for doubt as to the identity of the Challenger specimen with his species. The temptation is great to regard it as also synonymous with Sir Richard Owen's *Loligopsis ocellata,*[2] the more so as this is from the China Sea, while the Challenger individual was taken near Japan. The only differences which I can discover on a careful perusal of his diagnosis are, firstly, the form of the fin, which does not extend posteriorly beyond the extremity of the body; secondly, the smaller relative size of the suckers, and thirdly, the fact that the horny rings of these are extremely prominent and toothed.

The mantle-connective is a little more complicated than Verrill's description would indicate; the sockets on the base of the funnel are pyriform hollows, the deeper portion being posterior; the ridge on the mantle itself is divided into two portions, of which the posterior is much the more prominent, and separated by a distinct gap from the anterior, which is low and narrow.

[1] Ceph. N.E. Amer., p. 431.

[2] *Trans. Zool. Soc. Lond.,* vol. xi. p. 139.

The tentacular arm has been described but not figured by Verrill, a drawing of it is therefore appended here (figs. 12–14); the central series of suckers should have been represented as somewhat larger than the others as indicated by Verrill.

The pen (fig. 15) has a short, narrow, anterior extremity expanding into a subcaudate blade, posteriorly it curves round the hinder end of the viscera, and then is reflected as a very thin, irregular, membranous expansion.

The fact that the same species (or at all events two closely allied species) is found both in the Western Pacific and in the Western Atlantic is of great interest, and especially when considered in relation with the similar distribution of *Octopus januarii*, *Eledone verrucosa*, *Eledonella pygmæa*, and *Eledonella diaphana*.

The identification of the small specimen from New Zealand is uncertain.

Family XIII. Cranchiæformes, Steenstrup.

Subfamily Cranchiadæ, Gray.

Cranchia, Leach.

Cranchia (*Liocranchia*) *reinhardtii*, Steenstrup (Pl. XXXI. figs. 11–14; Pl. XXXII. figs. 1–4).

1857. *Leachia Reinhardtii*, Stp., Hectocotyldannelsen, p. 200.
1861. *Cranchia Reinhardtii*, Stp., Overblik, p. 76.
1879. *Loligopsis Reinhardtii*, Tryon, Man. Conch., vol. i. p. 165.
(*nec.*) 1882. *Cranchia Reinhardtii*, Brock, Zeitschr. f. wiss. Zool., Bd. xxxvi. p. 605.
1884. *Perotis Reinhardtii*, Rochebr., Monogr. Loligops., p. 25.
(*nec.*) 1884. *Cranchia cf. Reinhardtii*, Pffr., Ceph. Hamb. Mus., p. 29.

Habitat.—Station 106, August 25, 1873; lat. 1° 47′ N., long. 24° 26′ W.; depth, 1850 fathoms. Two young specimens, in all probability from the surface.

North Atlantic, lat. 15° to 28° N., long. 18° to 32° W. (Steenstrup); within the Tropics, longitude of the Azores (Kiel Museum, *fide* Steenstrup).

The Body (fig. 4) is rotund and barrel-shaped, the diameter being greater than half the length, bluntly rounded behind; a little in advance of the posterior extremity on the dorsal surface is a process containing the end of the pen (figs. 2, 3), to it are attached the *fins* for about half their length. They are subquadrate, the posterior angles being better marked than the anterior; they are attached by their inner margins, for the anterior moiety to the process of the body above mentioned, for the posterior to each other. The *mantle-margin* passes anteriorly in even curves from one point of attachment to another. From the point of attachment at either side of the funnel,

which is indicated by a cartilage-like speck in the body wall, there extend backwards two cartilage-like lines (fig. 11), diverging at an angle of some 60°, each of which bears about thirteen minute pointed papillæ; a similar row stands upon the tissue covering the gladius in the middle of the back. The *siphon* is short, bluntly conical, and usually projects only very little above the margin of the mantle.

The Head is very short but broad; the *eyes* are prominent and the lens protrudes from the larger portion of the organ; behind the eye is a papilla, and in front of and below it are several minute, white, spherical bodies (fig. 1), which in many cases are embedded in a prominent, irregularly-shaped mass of tissue.

The Arms (fig. 1) are short and very unequal, their order of length being 3, 4, 2, 1 (in some specimens 4 and 2 are almost equal); the third pair being twice as long as the second and three times as long as the first. Each arm bears two rows of minute pedunculate *suckers* (fig. 13), which have smooth horny rings. The *umbrella* extends halfway up the dorsal arms, and is of about the same breadth between them and the second and between these and the third, while it is absent between the ventral arms and between them and the third pair. The *buccal membrane* has five points, below it passes into two fillets which run side by side, separated by a narrow groove, to join the ventral arms (fig. 1). The *outer lip* is thin; the *inner* thick and rounded, both being smooth.

The Tentacles (fig. 12) are comparatively stout, twice as thick as the sessile arms, very slightly thickened towards the club, and then tapering to exceedingly fine points. The *club* has a very narrow delicate web up either side, and bears four rows of pedunculate *suckers* (fig. 14). These are rather larger at the middle of the club than at either end, and those of the two median series are slightly larger than the lateral ones; at the tip they are exceedingly minute; and two series of very small ones commence about half way up the stem and continue up to the club. They are spheroidal in form and oblique, with a small aperture, and a smooth *horny ring*, surrounded by long, narrow, radially disposed papillæ, from which radial grooves pass towards the margin.

The Colour (in the spirit specimens) is pale, almost white, semitransparent.

The Surface is smooth but for the papillæ above described.

The Gladius is as long as the mantle, very narrow, and slightly expanded behind into a lanceolate extremity.

The above description has been drawn up from specimens kindly lent to me by Professor Steenstrup; those obtained by the Challenger were young, only 7 to 8 mm. long in the body, and at first glance not at all unlike the figures of *Cranchia megalops*, Prosch,[1] and although I have no hesitation in referring them to *Cranchia reinhardtii*, they present many interesting differences from the more developed forms. The fins are smaller comparatively, the arms are shorter and have very few suckers, the dorsal arms

[1] Nogle nye Cephalopoder, figs. 4, 5, 6.

are represented only by papillæ, each bearing two suckers; the second pair are larger than the third and bear five suckers, while each ventral arm is indicated only by one very minute sessile sucker.

On the tentacles the suckers commence close to the base instead of half way up the stem, whence one would be disposed to infer that the growth of these organs takes place at the base rather than the apex. The club is not in the least expanded, and four rows of suckers are found only at the extreme tip. Below and in front of the eye are two or three minute white shining dots but no swollen mass of tissue. The usual four cartilage-like bands pass down the ventral surface, but the number of papillæ is less than in the adults, being only from seven to nine.

I am unable to refer to this species *Cranchia reinhardtii*, Brock,[1] and *Cranchia cf. reinhardtii*, Pfeffer.[2] The former differs so conspicuously in the form of the body, which indeed is more like that found in *Taonius* than that characteristic of *Cranchia*. It must be remembered, however, that the correct pictorial reproduction of the form of these specimens requires great care for its accomplishment. I distended the mantle-cavity of several specimens by means of a syringe, and only one of them (fig. 4) showed any conical process at the posterior extremity whatever, and that was very different from the form given in Brock's figure. This same specimen had, however, a number of spots, of which several situated on the ventral surface and on one fin are shown; they were not darkly pigmented, but pale, like the rest of the body, from which they seemed to differ in structure rather than colour; a few very faint markings could also be deciphered on the tentacles; there seemed, however, to be no other points indicating that this form was distinct from the others. It would be interesting should there be proved to exist a series of forms with more or less elongated bodies connecting *Cranchia* with *Taonius*.

Dr. Pfeffer's species, with regard to the position of which he expresses great doubt, does not appear to me to be *Cranchia reinhardtii*, Steenstrup; its body-form is quite different, resembling that of Brock's specimen, the web between the arms is present between the third and fourth pairs; the arms are compressed and the third and fourth provided with a fin, the tentacles have two ridges separated by a furrow, one of which expands into a web, and there are other smaller differences which a comparison of the descriptions will disclose.

Whether Pfeffer's specimen belongs to the same species as Brock's, I have of course no better means of ascertaining than had he.

Brock (*loc. cit.*) suggests on the basis of the specimen figured by him that *Cranchia reinhardtii* may be the same as *Cranchia maculata*, Leach; and as I have recently been able to examine the type of that species in the British Museum, it may be well to give some account of it here.

[1] *Zeitschr. f. wiss. Zool.*, Bd. xxxvi. p. 605, pl. xxxvii. fig. 4, 1882.
[2] Ceph. Hamb. Mus., p. 29, fig. 35.

The Mantle is so crumpled that it is almost impossible to ascertain its original outline, but it seems to have been rather elongated for a *Cranchia*, but not so long as a *Taonius*. It is fused with the head in the middle line dorsally, and also on each side in a minute cartilaginous patch with the base of the *siphon*, which is short and conical. The mantle has no tubercles, but is covered with oval black specks about 2 mm. apart. The *pen* forms a thin cartilaginous line down the back, and is very slightly expanded posteriorly. The *head* and *arms* are entirely wanting. The length is about 3 cm., the breadth 1 cm. It is readily distinguishable from Brock's form by the absence of tubercles on the mantle, and approaches more than any other form with which I am acquainted Dr. Pfeffer's *Megalocranchia*, which, however, there can be little doubt is based upon a small *Taonius*.

Cranchia sp.

Habitat.—Surface between the Cape and Marion Island. One young specimen mounted in Canada balsam.

About this portion of the cruise, Dr. v. Willemoes-Suhm notes in his diary that a few specimens of *Cranchia* were taken in every haul of the tow-net, but this is the only one that has come into my hands from this region.

Each sessile arm has only one sucker, except the ventral, which have two; the horny ring of the suckers seems to have no teeth, but is surrounded by papillæ. The tentacles have suckers with smooth rings, surrounded by two rows of papillæ, a point in which they differ from those of *Cranchia reinhardtii*, and some of them seem to have a fringe round the margin. The pen is not visible.

Taonius, Steenstrup.

Loligopsis (*pars*), d'Orbigny, Tryon, de Rochebrune, &c.
Desmoteuthis, Verrill.
Procalistes, Lankester.
Phasmatopsis, de Rochebrune.
Megalocranchia (?), Pfeffer.

Body elongated, semitransparent, head comparatively small, eyes prominent, sometimes very large. Mantle united with the back of the head by a firm band, which widens posteriorly, the surface of the back either directly continuous with that of the head, or marked off, if at all, by an exceedingly slight fold. Mantle also connected with the body at either side of the base of the funnel. Funnel devoid of a valve, but possessing Verrill's organ.[1] Fins meeting at the posterior end of the body usually in a point.

[1] By this name I denote an apparatus which has been found in every species of *Taonius* examined by me, except *Taonius cymoctypus*. It consists of two pads within the funnel near its base, and a little posterior to them in the middle line one or two tubercles. It is figured by Verrill, who first noticed it, in his *Desmoteuthis tenera* (Ceph. N. E. Amer., pl. lv. fig. 2*d*).

Arms short compared with the body, furnished with two rows of globular suckers.

Tentacles present, and bearing four rows of suckers on the distal extremity (*Taonius pavo*, doubtful as regards the last point, owing to mutilation).

Gladius long and narrow, somewhat expanded towards the fins and forming a hollow pointed cone behind.

The genus *Taonius* was established by Steenstrup in 1861 to include *Loligo pavo*, Lesueur, and *Taonius hyperboreus*, and since his description has been overlooked by most subsequent writers it may not be out of place to translate some parts of it.

In the first place, the whole family Cranchiæformes is characterised thus: "The mantle is firmly united with the head at three separate points—namely, directly in the dorsal median line, and indirectly by means of the funnel on either side of it, where there is usually a movable sliding cartilaginous articulation or hook in other Cephalopoda."[1] Then, under the heading *Taonius hyperboreus*, he adds: "As soon as the relations of the tentacles and the structure of the arms in the genus *Leachia* are carefully considered, it is obvious that *Loligopsis pavo*, Lesueur, and *Leachia hyperborea*, Steenstrup, which have hitherto been referred to it, must form a separate group. For in addition to the fact that the latter species has, and the former seems to have had, tentacles, both have narrow elongated fins, which extend along a large portion of the body, and are strikingly characterised by their enormous eyes, which almost meet on the ventral surface, and by a funnel, which is shorter and smaller than that of *Leachia*. The gladius agrees very well with that of other Cranchias, but may, on the whole, be described as expanded at the inferior extremity."

"The generic name *Taonius* is chosen more especially with reference to the longest known species, whose beautiful coloured spots suggested the specific name *pavo;* how far similar spots may have been present on the body of my species *hyperboreus*, I cannot say. . . . In case a division of the genus should become desirable, I regard the older species *Lol. pavo*, Les., as the type."

It appears from these passages that Steenstrup regarded *Loligo pavo*, Lesueur, as the type of his genus, and he did not consider it essential to make a long and detailed statement of its characters, because d'Orbigny had already done this when in 1839 he took Lesueur's *Loligo pavo*, named it *Loligopsis pavo*, and then proceeded to draw up a full generic diagnosis based upon this specimen and upon another (*Taonius cymoctypus*) which he erroneously regarded as belonging to the same species; in other words, Steenstrup's *Taonius* is practically identical with d'Orbigny's *Loligopsis*. It is of great importance that this should be clearly understood, because in 1882 Professor A. E. Verrill constituted[2] a new genus, *Desmoteuthis*, based upon a specimen captured near the

[1] Overblik, p. 70.

[2] Céph. N. E. Amer., p. 216.

northern edge of the Gulf Stream, which he erroneously regarded as identical with *Taonius hyperboreus*, Steenstrup. Another species, *Desmoteuthis tenera*, Verrill, which is almost certainly identical with the real *Taonius hyperboreus*,[1] has since been added to the genus.

The most striking character in the generic diagnosis of *Desmoteuthis* is "Anterior edge of the mantle united directly to the head, on the dorsal side, by a commissure, so that there is no free edge medially; . . . two additional muscular commissures unite the lateral inner surfaces of the mantle to the sides of the siphon." This may be compared with the first sentence translated above from Steenstrup, and with d'Orbigny's description of his genus *Loligopsis*,[2] in which occur the following words: "Appareil de résistance consistant en trois larges brides, ou attaches fixes, placés au bord même du corps, qui le lient intimement à la tête, l'une cervicale ou dorsale à l'extremité de la saillie médiane de la coquille. Les deux autres latérales inférieures au lieu ou est ordinairement l'appareil inférieur mobile." It seems almost impossible to resist the conclusion that he means hereby to describe a precisely similar structure; furthermore, in the drawing of his *Loligopsis pavo*,[3] the dorsal margin of the mantle is shown, extending on to the head behind the eye. The remainder of the definition of *Desmoteuthis* sounds almost like a translation of that of *Loligopsis*, and nowhere are they in contradiction, as any one may see who reads them side by side.

These quotations would probably suffice to show that *Desmoteuthis* must be regarded as a synonym of *Taonius*, but in addition I have recently had the opportunity of examining the following specimens belonging to this genus:—The type specimens of *Taonius pavo* and of *Taonius cymoctypus* in the Paris Museum, that of *Taonius hyperboreus* in the Copenhagen Museum, a somewhat mutilated specimen of the same species in the Challenger collection, and two from the "Porcupine" Expedition; a specimen of an unpublished species which Professor Steenstrup proposes to call *Taonius elongatus*[4] (Pl. XXVIII. fig. 13); and two specimens of *Taonius suhmi*, from the Challenger collection; and on the basis of this material the above description of the genus has been drawn up, which will, I think, leave no doubt as to its identity with *Desmoteuthis*. Not only is this the case, however, but it seems also most likely that the specimen which Verrill obtained from the northern edge of the Gulf Stream, and which he believed to be identical with *Taonius hyperboreus*, was none other than *Taonius pavo*.

That it differs from the former of these may be seen by a most cursory examination of the type specimen, or of Pl. XXXIII. fig. 1, and may be also seen by a careful comparison of Verrill's figures with Steenstrup's description.[5] *Taonius hyperboreus* is there defined

[1] *Op. cit.*, p. 412.

[2] Céph. acét., p. 320; Moll. viv., p. 368.

[3] Céph. acét. pl. iv. fig. 1; Moll. viv., pl. xxiii. fig. 6.

[4] *Taonius elongatus*, Stp., MS., is characterised by its elongated form, by the *body* being broadest anteriorly and tapering backwards at first rather suddenly, then more gradually. The *fin* is cordate and pointed behind like that of *Taonius suhmi* but much larger, and the *eyes* are comparatively small.

[5] Overblik, p. 84.

by its differences from *Taonius pavo*, viz.: "(1) the length and breadth of the fin, which is half the length of the body and six times as long as broad; (2) the large and almost regularly spherical suckers, which are several times larger than those of *Taonius pavo*, and especially on the lateral arms attain an astonishing size, so that the largest have a diameter as great as the breadth of the arm; and (3) the presence of a toothed marginal membrane along all the arms."

In every one of these characters it will be noticed that Professor Verrill's specimen differs from *Taonius hyperboreus*, and inclines rather to *Taonius pavo;* and further, a careful comparison of his figures and description with those of *Loligopsis pavo* (Lesueur), places it beyond all reasonable doubt that these are identical.

The general shape of the body is practically identical in the two forms, but the fin is produced in Verrill's drawing into "a long acute tip," which does not appear in Lesueur's, but which may very well have been present originally, for the posterior extremity of the type specimen has been injured.

In both specimens the arms are not complete, "except those of the third and fourth pairs, which are nearly equal in length, the ventral ones a little the shortest and most slender." In both specimens, too, "the arms are all united together by a thin, delicate basal web, which extends up some distance between the arms, . . . and then runs along the sides of the arms, as broad, thin, marginal membranes."

As regards the horny rings of the suckers, d'Orbigny figures two from the base of an arm which may have been taken from this species, and which have square-cut teeth somewhat variable in number. The sucker figured by Verrill from the middle of one of the lateral arms (third pair) resembles these very closely, and he adds that "toward the tips of the arms the smaller suckers again become deeper, with more contracted apertures, and with a few more prominent denticles on the rings;" but he does not allude to the conspicuously four-toothed suckers characteristic of *Taonius cymoctypus*, which he could not fail to have noticed had they been before him.

The general shape of the sucker, too, agrees fairly with that figured by Lesueur.

Verrill's account of the pen of his *Desmoteuthis hyperborea* describes that of *Loligopsis pavo* (Lesueur), very well, for the latter, like the former, terminates posteriorly in a hollow cone. This is not shown in Lesueur's drawing, though it is quite evident in the specimen; the drawing indeed is merely a sketch giving a general idea of the form of the pen, which has never been removed from the specimen.

The passages in quotation marks above are taken from Verrill's description, and when compared with d'Orbigny's figures, they leave, I think, little room for doubt that the two species in question are the same.

Taonius hyperboreus, Steenstrup (Pl. XXXII. fig. 12; Pl. XXXIII. figs. 1–11).

1856. *Leachia hyperborea*, Stp., Hectocotyl., p. 200.
1861. *Taonius hyperboreus*, Stp., Overblik., p. 83 (*non* Verrill).
1870. *Leachia ellipsoptera*, Carpenter, Jeffreys and Thomson, Proc. Roy. Soc. Lond., vol. xviii. p. 423.
1879. *Loligopsis hyperborea*, Tryon, Man. Conch., vol. i. p. 162.
1882. *Desmoteuthis tenera* (*?*), Vll., Ceph. N. E. Amer., p. 412, pl. lv. fig. 2; pl. lvi. fig. 3.
1884. *Taonius hyperboreus*, Vll., Second Catal., p. 245.
1884. *Loligopsis hyperborea*, Rochebr., Monogr. Loligopsidæ, p. 12.
1885. *Taonius hyperboreus*, Hoyle, Loligopsis, p. 321.

Habitat.—Station 50, South of Halifax, Nova Scotia, May 21, 1873; lat. 42° 8′ N., long. 63° 39′ W.; 1250 fathoms; blue mud. One specimen, ♂, probably from the surface.

North Atlantic, 140 miles north-west of the Irish Coast, July 2, 1869; lat. 56° 10′ N., long. 13° 16′ W.; surface ("Porcupine" Expedition). Two specimens.

North Greenland (Steenstrup). Off Martha's Vineyard, 87½ miles from Gray Head; 388 fathoms (?)[1]; two specimens. Off the New England Coast, lat. 39° 27′ 10″ N., long. 69° 56′ 20″ W.; 1346 fathoms (?)[1]; one specimen, Verrill.

The Body (fig. 1) is elongated, tapering posteriorly; the *mantle* is thin, enclosing an enormous branchial cavity, only a small portion of which is occupied by the viscera; its anterior border is transverse or projects slightly in the dorsal median line and at each lateral attachment; in the former of these positions the surface of the body is almost continuous with that of the head, only the very slightest fold of the mantle marking it off. The *fin* is about half the length of the body and of an elongated cordate shape, the form of the hinder margin being, however, slightly variable. The *siphon* is triangular, and reaches to about the centre of the head; on its dorsal wall, immediately behind the aperture, are two low cushion-like papillæ in the middle line, and behind these three long, pointed papillæ arranged in a triangle with the apex directed forwards.

The Head proper is small, much smaller than either of the enormous globular *eyes*, which occupy the whole of its two lateral surfaces.

The Arms are short, on an average about one-third the length of the body; their order of length is 3, 2, 1, 4; a toothed membrane extends along the arms, but forms only a very small web between them (fig. 12). They are furnished with two rows of suckers, most numerous and closely packed on the dorsal arms. The *suckers* (figs. 2–5) are subglobular, the proximal half of the globe being opaque and muscular, the distal corneous and semitransparent. The suckers on the dorsal and ventral arms are subequal, and also on the lateral arms for the proximal half of their length; on the third quarter are situated about eight large suckers, whose diameter fully equals that of

[1] The query is not intended to imply any doubt as to the accuracy of the observations, but merely as to whether the specimen was taken at the bottom.

the arms; on the terminal fourth the suckers gradually diminish. The margin of the larger suckers is almost entire but marked out into irregular very shallow, square-cut teeth (figs. 2, 3); on the distal margins of the smaller suckers the teeth become more prominent, but are blunt, and about eight to ten in number.

The Tentacles (fig. 6) are but little longer than the arms, and only slightly expanded at their extremities. On the inner side of the stem is a groove which bears two and afterwards four irregular rows of very minute suckers (fig. 7), among which are a number of fixing-cushions (fig. 10). On the *club* are four rows of suckers about as large as the smaller ones on the arms; their *horny rings* are provided on the proximal semicircumference with about fifteen closely set subacute teeth, while the distal semicircumference bears about nine long very acute teeth (fig. 8, 9).

The Surface is smooth.

The Colour is pale yellowish-grey; a number of purplish chromatophores cover the mantle, and there are also a number of larger spots disposed in irregular rows, of which there are about ten down the mantle.

The Gladius (fig. 11) is long, narrow anteriorly, expanded in the posterior half, and forming a hollow terminal cone enclosing part of the genital gland.

Taonius suhmi (Lankester), Hoyle (Pl. XXXII. figs. 5–11).

1884. *Procalistes Suhmii*, Lankester, Quart. Journ. Micr. Sci., N.S., vol. xxiv. p. 311, figs. 1, 2.
1885. *Taonius suhmii*, Hoyle, in Narr. Chall. Exp., p. 472, figs. 173, 174.

Habitat.—Station 159; Southern Ocean due south of Australia, March 10, 1874; lat. 47° 25′ S., long. 130° 22′ E.; 2150 fathoms. Surface (?) Two specimens.

Between Sydney and Wellington, June 16–17, 1874. Three young specimens mounted as microscopic objects, and one preserved in spirit. Surface.

North Atlantic, off the coast of Africa, April 13, 1876. Surface. One small specimen.

The Body is elongated and fusiform, broadest about one-third back, narrowing gradually forwards and tapering to an acuminate point behind. The *fin* is small, about one-eighth the length of the body, and cordate in form. The *mantle-margin* is directly transverse, and forms three watch-pocket-like openings between its dorsal and lateral attachments, and at each of the latter of these is an oblong semitransparent piece of cartilage-like material. The *siphon* is long, reaching as far as the bases of the arms, and tapering; it opens anteriorly by a transverse slit.

The Head is small and subquadrate, its anterior end being entirely occupied by the bases of the arms, and the hinder portion of its sides by the large pedunculate eyes (fig. 5).

The Arms are unequal, the order of length being 4, 3, 2, 1, and on an average

about one-fifth the length of the body; they are slender, tapering and rounded, and neither keeled nor webbed. The *suckers* are in two series, spheroidal, and provided with smooth horny rings (fig. 6).

The Tentacles (fig. 9) are about three-fourths as long as the body, slender, cylindrical, not expanded into a distinct club; the extremity bears four series of suckers, the marginal ones being a little smaller than the median. The *suckers* (fig. 7) are of quite normal shape, and the *horny ring* both of the median and marginal ones bears four strong bluntly pointed teeth (figs. 7, 8).

The Surface is smooth throughout.

The Colour is pale, almost white, and the mantle semitransparent even when preserved, no doubt quite so when living; a number of oblong chromatophores are arranged in about eight transverse rows (fig. 5).

The Gladius, so far as could be ascertained without extraction, does not differ materially from that of the other species of the genus.

Dimensions.

Length, total,	82 mm.
End of body to mantle-margin,	42 „
End of body to eye,	45 „
Breadth of body,	12·5 „
Breadth of head,	3 „
Breadth of head across the eyes,	11 „
Length of fin,	7 „
Breadth of fin,	4 „

	Right.	Left.
Length of first arm,	5 mm.	5 mm.
Length of second arm,	6 „	6 „
Length of third arm,	8 „	8 „
Length of fourth arm,	8·5 „	8·5 „
Length of tentacle,	33 „	37 „

The three small specimens taken in the Southern Ocean demand a careful discussion, inasmuch as they and the drawing by Dr. v. Willemoes-Suhm, reproduced in the accompanying woodcut (fig. 9), were made by Professor Lankester the basis of a new genus, *Procalistes*, characterised as follows :—"Similar to Cranchia, excepting that the eyes are pedunculate, that the shorter perioral arms are aborted, and that the longer (so-called prehensile) arms are devoid of suckers. In the youngest stage observed there are two rows of suckers on the long arms, and six isolated and pedunculated suckers surrounding the mouth, which appear to represent the shorter arms of other Cephalopods."

The capture of these individuals is thus alluded to in Dr. v. Willemoes-Suhm's MS. journal.

"16th June, 1874.—Among the surface gatherings there is a transparent and very interesting Pteropod, with large eyes on the tentacles and without any 'ptera' or foot. Having obtained three more or less damaged specimens from which I could not complete its anatomy, I shall have to defer giving a proper account of it. The animal belongs to the Clionidæ, and is probably allied to Pelagia, Quoy and Gaimard."

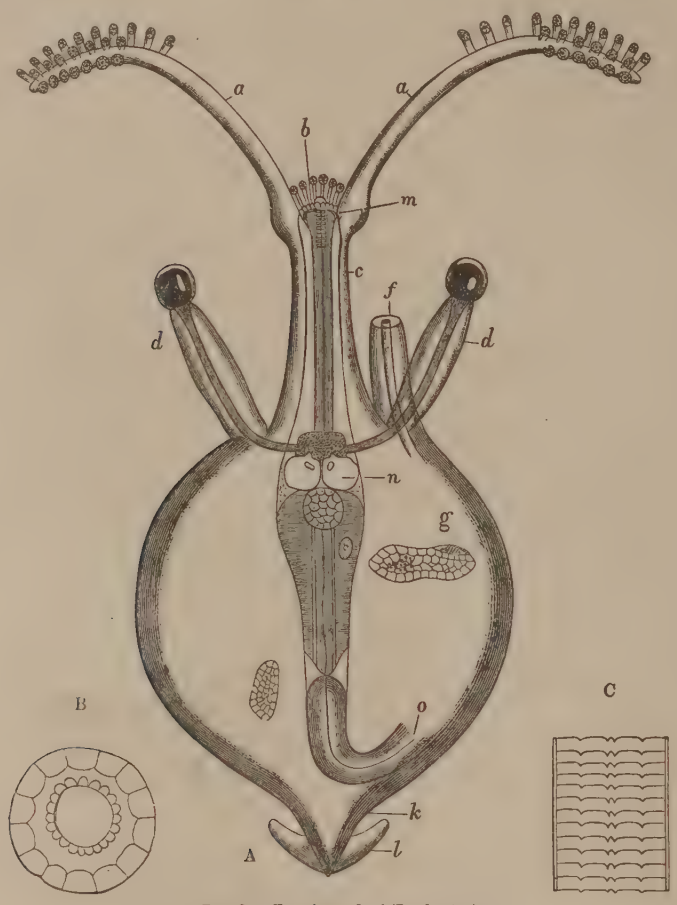

FIG. 9.—*Taonius suhmi* (Lankester).

A. a living specimen, drawn by v. Willemoes-Suhm, magnified about 25 diameters. *a*, *a*, tentacles; *b*, six of the sessile arms, each bearing one sucker; *c*, the neck; *d*, *d*, the pedunculate eyes; *f*, the siphon; *g*, the ink-bag; *k*, the posterior extremity of the body, much more elongated in the adults of this genus; *l*, the fins; *m*, the buccal apparatus; *n*, the oto-cysts; *o*, the intestine. B. One of the tentacular suckers, more highly magnified. C. A portion of the radula, more highly magnified.

On a piece of paper attached to the drawing are the following particulars regarding the structure of the animal.

"Clionid Pteropod: June 16th—18th, 1874. In the warm East Australian current coming from the north (surface temperature 18° C.), together with Calcarella on the

voyage from Sydney to Wellington, lat. 34° 50′ S., long. 155° 28′ E. In all only three specimens, of which the largest alone showed the eyes well. It measured 13 mm. long; tentacles 6—7 mm. long; eye peduncles 2 mm. long. Neither of the smaller specimens showed anything new. Tentacles with suckers, of which one is strongly magnified below (woodcut 9, B). Mouth with six suckers, two teeth, and radula; the latter, as far as I could make it out without injury to the animal, is drawn below to the right hand side (woodcut 9, C). The mouth leads into an œsophagus; this into a muscular stomach, in the muscular wall of which is a unicellular gland *à la nematode*. Sharply defined intestine (*o*) which I could not follow out to the anus on the process to the right (woodcut 9, *f*). Ganglion superius sends out the nerves to the eyes; between it and the ganglion inferius are the two otolithic vesicles (*n*). On the right side the generative gland is seen with reddish oil specks, and in the corner black pigment (*g*); to the left is a cellular body, probably an excretory organ. Subsequently it seemed to me as though there was a calamus in the hindermost portion of the animal; this must however, have been a mistake. Heart not seen."

Two of the three specimens were mounted in glycerine and labelled "Clionide, 17 June, 74, Sidney—Wellington;" from one of them the mounting fluid had escaped, leaving the specimen so much dried that no efforts were successful in restoring it; in what follows it will for the sake of brevity be alluded to as the "damaged" specimen.

The second specimen was in a much better state of preservation than the first, as may be seen from the drawing (Pl. XXXII. fig. 11); it will be called the "complete" specimen.

The third specimen was labelled "Clionide, 16 June, 74, Sidney—Wellington;" it had been stained with carmine and mounted in balsam, and will be referred to as the "stained" specimen. It is the largest and is mentioned by Suhm as being the only one which showed the eyes well. Probably it contributed more than either of the others to Lankester's restoration, which is here reproduced (woodcut 10), seeing that its disposition on the slide somewhat resembles his figure, and it is the only one destitute of suckers, and seeing that the explanation of his figure specially mentions that it was taken from a "somewhat older specimen" than Suhm's.

This absence of suckers is the most important character in Lankester's definition, for, as I shall mention later, the remaining points are such as either belong properly to the genus *Taonius* or are indicative of immaturity.

Professor Lankester admits that "they may possibly have been rubbed off by rough usage of the specimens," but he inclines "to believe that they are naturally absent in the later stage." It is to be noted, however, that the "complete" specimen does possess suckers, although owing to an unfortunate accident these escaped Lankester's attention; when the specimen came into my hands a large part of it was concealed by the dark cement which had been used in fixing down the cover-glass, and which had spread over

it, probably owing to the heat of the tropics, through which it must have passed three times. The hidden portion included the oral region and the tentacles, and when the superfluous material was scraped away these were seen to present the appearance shown in Pl. XXXII. fig. 11.

Since then two out of three specimens exhibit the suckers (for they can be made out

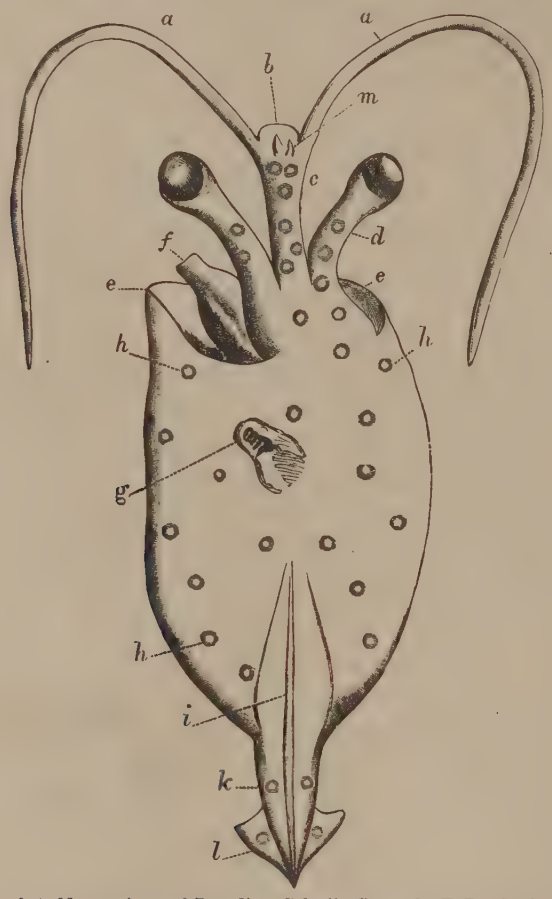

FIG. 10.—"A somewhat older specimen of *Procalistes Suhmii*. Drawn by E. Ray Lankester from a specimen mounted on a glass slide in balsam by R. von Suhm. Magnified 20 diameters.

"*a*, The long 'arms' or processes of the fore-foot; *b*, the smooth buccal margin devoid of processes; *c*, the elongated neck; *d*, the pedunculated eyes; *e*, the edge of the mantle flap, separated from its attachment to the head and funnel by pressure; *f*, the funnel or siphon; *g*, the anal process seen through the transparent mantle, and showing a spiral band of black pigment lying in the ink-bag; *h*, chromatophores; *i*, the pen; *k*, the median posterior process of the body; *l*, the lateral fins attached to the same; *m*, the two horny beaks of the buccal apparatus." (Lankester, *loc. cit.*)

in the "damaged" one), and since the "complete" example is almost as large as the "stained" one, it seems to me more natural to adopt the alternative hypothesis rejected by Professor Lankester, and to believe that the suckers are not present in the one specimen because they have been accidentally removed. This view is strengthened by

the fact that the stained specimen has been largely denuded of its epidermis, which can be seen in places adhering to the tentacle and also to the circumoral region.

In addition to this, there was a small Cephalopod in the collection preserved in spirit, which there can be no reasonable doubt is identical with the three specimens above discussed although it was taken in the Atlantic. From the figure of it here given (Pl. XXXII. fig. 10) it is seen to have the same stalked eyes and long process carrying the mouth and arms, the same form of body, and (so far as can be seen) of pen, and the same distribution of chromatophores. Also since the figure just referred to was drawn I have received another specimen from Dr. Pelseneer, who found it among the collection of Pteropods on which he is engaged, and it is of special importance because it was taken at the same locality as the three examples mounted by Suhm. It resembles the Atlantic specimen so closely that the drawing might have been equally well made from either.

The arms are rudimentary and carry each one sucker, and here it may be observed that in every Cephalopod the arms pass through a stage in which they have each only one sucker. In the case of *Cranchia* and allied genera, where even in the adult the sessile arms are very short, it is only reasonable to expect this one-suckered stage at a much later period of development than in such forms as *Loligo*, where they reach a comparatively greater length, and as above mentioned (p. 185), specimens of *Cranchia reinhardtii* have been seen in the present collection, in which the arms were quite rudimentary, although the animals had attained more than one-third of their usual dimensions. In the present example the suckers stand upon small papillæ, which are obviously rudimentary arms, an arrangement not visible in the mounted specimens (see fig. 10).

Furthermore the correspondence between these small spirit specimens and the two larger ones from the Southern Ocean, which must be regarded as the types of the species, is so close that it is impossible to do otherwise than consider them as identical. The resemblance is especially great in the form of the body, and of the fin and of the head, though the neck and the ocular peduncles are not so long in the less as in the more mature specimen. This last, however, is a phenomenon seen in the development of every Cephalopod; for example, in *Sepia* the eye is much more prominent in the embryo than in the adult (compare Kölliker's drawing[1] with any of the illustrations in Pls. XVI. to XXII.) and in the case of Grenacher's pelagic larva[2] one of the stages observed (fig. 8) has the eyes distinctly pedunculate, while in a somewhat later stage this appearance is almost entirely lost (fig. 12).

If the identifications above made be correct there is no doubt that the only character by which the genus *Procalistes* can be differentiated from *Taonius* disappears, and the two genera must therefore be regarded as synonymous.

Before leaving this subject, however, it is only right to mention that Professor

[1] Entwickel. d. Cephalop., taf. iii. figs. xxvii.–xxxi., Zürich, 1844.

[2] *Zeitschr. f. wiss. Zool.*, Bd. xxiv pl. xi.

Steenstrup, with whom I had the great pleasure and profit of discussing this question, does not entirely agree with what has been advanced above, but is disposed to refer the stained specimen to a different species from the others, and that for the following reasons:—

1. The pigment spots in its mantle are very black and opaque, and circular in form, resembling those depicted in Grant's figure of *Loligopsis guttata*,[1] while those of the other specimens are much paler and with more dispersed pigment.

2. Because he was of opinion that two more or less parallel lines might be seen along the body, which seemed to represent the rows of points down the ventral surface of *Leachia*.

I am by no means prepared to say that such is not the case, and it is only with the utmost diffidence that I differ from my illustrious friend, but I think that the first point alluded to may be explained by the pigment of the chromatophores being in a state of concentration in the one case, while it was diffused in the other, and as regards the second I must confess that on repeated examination I have been unable to make out the rows of points with any certainty. On the whole, therefore, I am disposed to believe that these preparations represent only one species.

This form presents a remarkable likeness in many respects to *Loligopsis zygæna* Vérany,[2] but differs in several important particulars, so that it is impossible to regard the two as identical. The points of difference are (1) the shape of the fin, (2) the absence of suckers on the stems of the tentacles, and (3) the presence of chromatophores.

Grenacher's Pelagic Larva.

Habitat.—South Atlantic, March 21, 1876; lat. 21° 15′ S., long. 14° 2′ W.; surface temperature at noon 76°·5.

Among the microscopic preparations mounted during the voyage was one bearing the above date, which contained three embryos closely resembling those figured by Grenacher,[3] but they were not sufficiently well preserved to render it possible to make any observations of value upon them.

[1] *Trans. Zool. Soc. Lond.*, vol. i. pl. ii. figs. 1, 2. [2] Céph. médit., pl. xl. fig. *c*.
[3] *Zeitschr. f. wiss Zool.*, Bd. xxiv. pp. 419-498, 1874.

Order II. TETRABRANCHIATA, Owen.

Family XXII. NAUTILIDÆ.

Nautilus, Linné.

Nautilus pompilius, Linné.

1758. *Nautilus pompilius*, Linn., Syst. nat., ed. x. p. 709; No. 283, 233.
1868. „ „ Küster, Conch. Cab., sec. 55, p. 9, taf. ii. fig. 9.

Habitat.—Station 173, off Matuku, Fiji Islands; June 24, 1874; lat. 19° 9′ 35″ S., long. 179° 41′ 50″ E.; 315 fathoms; coral mud. One specimen.

The specimen of *Nautilus pompilius* obtained by the Challenger was not in the collection when it came into my hands, so that I can give no further information regarding it than is contained in the following quotation from the Narrative.

"In dredging off Matuku Island, in 310 and 315 fathoms, on a coral bottom, some *Phorus*, *Turritella*, and a few other shells were brought up, as well as numerous specimens of the blind Crustacean, *Polycheles*, and other animals showing the fauna to be a true deep-water one.

"A living specimen of the Pearly Nautilus (*Nautilus pompilius*), so rarely seen in the living condition by any naturalist, was captured here. This was the only specimen of this animal obtained by the dredge or trawl during the voyage. The animal was very lively, though probably not so lively as it would have been if it had been obtained from a less depth, the sudden change of pressure having no doubt very much disarranged its economy. However, it swam round and round a shallow tub in which it was placed, moving after the manner of all Cephalopods, backwards, that is with the shell foremost. It floated at the surface with a small portion of the top of the shell just out of the water, as observed by Rumphius.[1] The shell was maintained with its major plane in a vertical position, and its mouth directed upwards. The animal seemed unable to sink, and the floating of the shell, as described, was due no doubt to some expansion of gas in the interior, occasioned by diminished pressure. The animal moved backwards slowly by a succession of small jerks, the propelling spouts from the siphon being directed somewhat downwards, so that the shell was rotated a little at each stroke, upon its axis, and a slightly greater area of it raised above the surface of the water. Occasionally, when the animal was frightened or touched, it made a sort of dash, by squirting out the water from its siphon with more than usual violence, so as to cause a strong eddy on the surface of the water. On either side of the base of the membranous operculum-like head-fold, which, when the animal is

[1] De Amboinsche Rariteitkamer, p. 61, Amsterdam, 1705.

retracted, entirely closes the mouth of the shell, the fold of the mantle closing the gill cavity was to be seen rising and falling, with a regular pulsating motion, as the animal in breathing took in the water, which was afterwards expelled through the siphon. The tentacle-like arms contrast strongly with those of most other Cephalopods, because of their relatively extreme slightness and shortness, though they are not shorter proportionately than those of the living *Sepia*. They are held by the animal, whilst swimming, extended radially from the head, somewhat like the tentacles in a sea anemone; but each pair has its definite and different direction, which is constantly maintained. This direction of the many pairs of tentacles at constant but different angles from the head, is the most striking feature to be observed in the living Nautilus. Thus, one pair of tentacles was held pointing directly downwards; two other pairs, situated just before and behind the eyes, were held projecting obliquely outwards and forwards, and backwards respectively, as if to protect the organs of sight. In a somewhat corresponding manner, the tentacular arms of the common cuttle-fish whilst living are maintained in a marked and definite attitude, as may be observed in any aquarium. Another living Nautilus was brought to the Consul at Kandavu during the stay of the Challenger. The natives were said to frequently catch them alive, and to give them to their chiefs, who eat them."[1]

[1] Narr. Chall. Exp., vol. i. pp. 490, 491.

GEOGRAPHICAL DISTRIBUTION.

LIST OF STATIONS,

SHOWING THE PHYSICAL CONDITIONS AND THE SPECIES OBTAINED AT EACH.

STATION 2.—South-west of Tenerife, February 17, 1873; lat. 25° 52′ N., long. 19° 22′ W.; 1945 fathoms; Globigerina ooze; bottom temperature, 36°·8; surface temperature, 67°. Dredge.

Mastigoteuthis agassizii.

North Atlantic, between Tenerife and St. Thomas, Danish West Indies.

Tremoctopus atlanticus.

St. Thomas, Danish West Indies, 8 fathoms.

Octopus tehuelchus.

North Atlantic, between St. Thomas, West Indies, and Bermuda, surface.

Teleoteuthis caribbæa.

Bermuda.

Octopus bermudensis, n. sp.

STATION 49.—South of Halifax, Nova Scotia, May 20, 1873; lat. 43° 3′ N., long. 63° 39′ W.; 85 fathoms; gravel, stones; bottom temperature, 35°; surface temperature, 40°·5. Dredge.

Rossia (?) tenera.

STATION 50.—South of Halifax, Nova Scotia, May 21, 1873; lat. 42° 8′ N., long. 63° 39′ W.; 1250 fathoms; blue mud; bottom temperature, 38°; surface temperature, 45°. Dredge.

Taonius hyperboreus.

Station 106.—Between St. Vincent and St. Paul's Rocks, August 25, 1873; lat. 1° 47′ N., long. 24° 26′ W.; 1850 fathoms; Globigerina ooze; bottom temperature, 36°·6; surface temperature, 78°·8. Taken in a surface-net at a depth of 40 fathoms.

Cranchia reinhardtii.

North Atlantic (picked up dead from the surface).

Alloposus mollis.

Atlantic; collected from the surface.

Spirula peronii (shells).

Station 122.—Off Barra Grande, September 10, 1873; lat. 9° 5′ S., long. 34° 50′ W.; 350 fathoms; red mud; surface temperature, 77°·5. Trawl.

Octopus januarii, n. sp.

Station 122B.—Off Barra Grande, September 10, 1873; lat. 9° 9′ S., long. 34° 53′ W.: 32 fathoms; red mud; surface temperature, 77°·5. Trawl.

Octopus tuberculatus.

Station 126.—Off the Rio San Francisco, Brazil, September 12, 1873; lat. 10° 46′ S., long. 36° 8′ W.; 770 fathoms; red mud; surface temperature, 77°. Trawl.

Japetella prismatica, n. sp.

Inaccessible Island, Tristan da Cunha, October 16, 1873; collected on the shore.

Octopus verrucosus, n. sp.

Simon's Bay, Cape of Good Hope, December 1873; 10–20 fathoms.

Octopus granulatus.

Cape of Good Hope, December 1873.

Argonauta argo.

Between the Cape and Marion Island.

Cranchia sp.

Station 146.—Between Prince Edward Island and the Crozets, December 29, 1873; lat. 46° 46′ S., long. 45° 31′ E.; 1375 fathoms; Globigerina ooze; bottom temperature, 35°·6; surface temperature, 43°. Trawl.

Cirroteuthis magna, n. sp.

Station 147.—Southern Ocean, between Prince Edward Island and the Crozets, December 30, 1873; lat. 46° 16′ S., long. 48° 27′ E.; 1600 fathoms; Diatom ooze; bottom temperature, 34°·2; surface temperature, 41°. Trawl.

Bathyteuthis abyssicola, n. sp.

Station 151.—Off Heard Island, February 7, 1874; lat. 52° 59′ 30″ S., long. 73° 33′ 30″ E.; 75 fathoms; volcanic mud; surface temperature, 36°·2. Dredge.

Octopus levis, n. sp.

Station 157.—Southern Ocean, March 3, 1874; lat. 53° 55′ S., long. 108° 35′ E., 1950 fathoms; Diatom ooze; bottom temperature, 32°·1; surface temperature, 37°·2. Trawl.

Eledone rotunda, n. sp.

Station 159.—Southern Ocean, due south of Australia, March 10, 1874; lat. 47° 25′ S., long. 130° 22′ E.; 2150 fathoms; Globigerina ooze; bottom temperature, 34°·5; surface temperature, 51°·5. Trawl.

Taonius suhmi, n. sp.

Station 162.—Off East Moncœur Island, Bass Strait, April 2, 1874; lat. 39° 10′ 30″ S., long. 146° 37′ E.; 38 fathoms; sand and shells; surface temperature, 63°·2. Dredge.

Octopus boscii, var. *pallida*, nov.

Station 163a.—Off Twofold Bay, Australia, April 4, 1874; lat. 36° 59′ S., long. 150° 20′ E.; 150 fathoms; green mud; surface temperature, 71°. Trawl?

Octopus boscii, var. *pallida*, nov. | *Octopus duplex*, n. sp.

Sepia cultrata, n. sp.

Port Jackson, Australia, 2 to 15 fathoms.

Octopus australis, n. sp. | *Octopus pictus*, var. *fasciata*, nov.

Between Sydney and Wellington, June 16, 17, 1874. Surface.

Taonius suhmi, n. sp.

Station 168.—East of the North Island, New Zealand, July 8, 1874; lat. 40° 28′ S., long. 177° 43′ E.; 1100 fathoms; blue mud; bottom temperature, 37°·2; surface temperature, 57°·2. Trawl.[1] Taken at the surface.

Calliteuthis reversa?

[1] The label reads "1100 fs. surface."

Station 170.—Off the Kermadec Islands, July 14, 1874; lat. 29° 55′ S., long. 178° 14′ W.; 520 fathoms; volcanic mud; bottom temperature, 43°; surface temperature, 65°. Trawl.

Amphitretus pelagicus, n. sp.

Station 170A.—Off the Kermadec Islands, July 14, 1874; lat. 29° 45′ S., long. 178° 11′ W.; 630 fathoms; volcanic mud; bottom temperature, 39°·5; surface temperature, 65°·2. Trawl.

Eledone verrucosa.

Station 171.—North of the Kermadec Islands, July 15, 1874; lat. 28° 33′ S., long. 177° 50′ W.; 600 fathoms; hard ground; bottom temperature, 39°·5; surface temperature, 66°·5. Trawl.

Cirroteuthis meangensis, n. sp.

The Reefs, Tongatabu, 18 fathoms.

Octopus tonganus, n. sp.

Station 173.—Off Matuku, Fiji Islands, July 24, 1874; lat. 19° 9′ 35″ S., long. 179° 41′ 50″ E.; 315 fathoms; coral mud; surface temperature, 76°. Dredge.

Nautilus pompilius.

The Reefs, Kandavu, Fiji.

Octopus vitiensis, n. sp.

Surface of the harbour, Kandavu, Fiji.

Sepioteuthis lessoniana.

Between Api, New Hebrides, and Cape York, August 22, 1874; from the stomach of a specimen of *Sula piscator*, which alighted on the ship.

Ommastrephes oualaniensis.

Station 181.—Off the south-eastern extremity of Papua, August 25, 1874; lat. 13° 50′ S., long. 151° 49′ E.; 2440 fathoms; red clay; bottom temperature, 35°·8; surface temperature, 80°. Trawl.

Cirroteuthis pacifica, n. sp.

Raine Island, Torres Strait; picked up on the shore.

Spirula peronii (shells).

STATION 188.—Arafura Sea, south of Papua, September 10, 1874; lat. 9° 59′ S., long. 139° 42′ E.; 28 fathoms; green mud; surface temperature, 78°·5. Trawl and dredge.

Octopus sp.
Sepia smithi, n. sp.
Sepia papuensis, n. sp.
Sepia elliptica, n. sp.
Sepia (*Metasepia*) *pfefferi*, n. sp.
Loligo indica.

STATION 190.—Arafura Sea, south of Papua, September 12, 1874; lat. 8° 56′ S., long. 136° 5′ E.; 49 fathoms; green mud; surface temperature, 79°·2. Trawl.

Sepia elliptica, n. sp.
Loligo indica.

STATION 192.—Off the Ki Islands, south of Papua, September 26, 1874; lat. 5° 49′ 15″ S., long. 132° 14′ 15″ E.; 140 fathoms; blue mud; surface temperature, 82°. Trawl.

Octopus areolatus.
Sepia sulcata, n. sp.
Sepia kiensis, n. sp.

STATION 194A.—Off Banda, September 29, 1874; lat. 4° 31′ S., long. 129° 57′ 20″ E.; 360 fathoms; volcanic mud; surface temperature, 82°·5. Trawl.

Spirula peronii (animal).

Banda.

Octopus bandensis, n. sp.

STATION 195.—Off Amboina, October 3, 1874; lat. 4° 21′ S., long. 129° 7′ E.; 1425 fathoms; blue mud; bottom temperature, 38°; surface temperature, 82°. Trawl.

Enoploteuthis margaritifera.

Ternate, presented by the Resident.

Sepioteuthis lessoniana.

STATION 203.—Off Panay, Philippine Islands, October 31, 1874; lat. 11° 6′ N., long. 123° 9′ E.; 20 fathoms; mud; surface temperature, 85°. Trawl.

Loligo galatheæ.

STATION 207.—Off Tablas Island, January 16, 1875; lat. 12° 21′ N., long. 122° 15′ E.; 700 fathoms; blue mud; bottom temperature, 51°·6; surface temperature, 80°. Trawl.

Sepia recurvirostra.

Station 214.—Off the Meangis Islands, February 10, 1875; lat. 4° 33′ N., long. 127° 6′ E.; 500 fathoms; blue mud; bottom temperature, 41°·8; surface temperature, 80°·5. Trawl.

Cirroteuthis meangensis, n. sp.

Station 216a.—North of Papua, February 16, 1875; lat. 2° 56′ N., long. 134° 11′ E.; 2000 fathoms; Globigerina ooze; bottom temperature, 35°·4; surface temperature, 82°·8. Surface.

Spirula peronii (shell).

North-east of Fort D'Urville, Papua, February 22, 1875. Surface.

Spirula peronii (shell).

Station 220.—North of Papua, March 11, 1875; lat. 0° 42′ S., long. 147° E.; 1100 fathoms; Globigerina ooze; bottom temperature, 36°·2; surface temperature, 83°·8. Trawl.

Eledonella diaphana, n. sp.

Pacific Ocean, 2° north of the Admiralty Islands, March 13, 1875; surface.

Ommastrephes oualaniensis.

North Pacific, April 3, 1875; lat. 24° 49′ N., long. 138° 34′ E. Surface.

Octopus brevipes (?).

North Pacific, off Volcano Island, April 3 and 5, 1875; about lat. 24° 49′ N., long. 138° 34′ E.

Teleoteuthis caribbæa (?).

Western Pacific, between Papua and Japan.

Tremoctopus gracilis (?).

Yokohama, Japan, purchased in the market.

Octopus macropus.
Sepia esculenta, n. sp.
Sepia andreanoides, n. sp.
Loligo edulis, n. sp.
Loligo japonica, n. sp.

Station 232.—The *Hyalonema*-ground, off Ino Sima Island, Japan, May 12, 1875; lat. 35° 11′ N., long. 139° 28′ E.; 345 fathoms; green mud; bottom temperature, 41°·1; surface temperature, 64°·2. Dredge and trawl.

Calliteuthis reversa.

STATION 233.—Bay of Kobé, Japan, May 17–19, 1875; lat. 34° 39′ N., long. 135° 14′ E.; 8 fathoms; mud; surface temperature, 62°·3. Dredge.

Inioteuthis morsei. | *Sepia kobiensis*, n. sp.

Loligo kobiensis, n. sp.

STATION 233c.—Inland Sea, Japan, May 28, 1875; lat. 34° 18′ N., long. 133° 21′ E.; 12 fathoms; blue mud; bottom temperature, 59°·9; surface temperature, 66°·8. Trawl.

Sepiella maindroni (?). | *Loligo kobiensis*, n. sp.

Todarodes pacificus.

STATION 237.—South-east of Nosima, Japan, June 17, 1875; lat. 34° 37′ N., long. 140° 32′ E.; 1875 fathoms; blue mud; bottom temperature, 35°·3; surface temperature, 73°. Trawl.

Octopus januarii, n. sp. | *Promachoteuthis megaptera*, n. sp.

Reefs, Honolulu, Sandwich Islands.

Octopus marmoràtus, n. sp.

Pacific Ocean, south of the Sandwich Islands, September 2, 1875; lat. 5° 54′ N., long. 147° 2′ W. (Taken from the stomach of a shark.)

Chiroteuthis (?) sp.

STATION 271.—Central Pacific, September 6, 1875; lat. 0° 33′ S., long. 151° 34′ W.; 2425 fathoms; Globigerina ooze; bottom temperature, 35°; surface temperature, 78°·7. Trawl.

Enoploteuthis margaritifera.

South Pacific, between the Sandwich Islands and Tahiti, September 15, 1875; lat. 12° 8′ S., long. 150° 13′ W.; surface temperature, 80°.

Tremoctopus quoyanus.

Off Valparaiso, October 21, 1875; surface to 30 fathoms.

Onychoteuthis sp.

South Pacific, November 1, 5, 7, and 11, 1875; about lat. 38° 7′ S., long. 94° 4′ W.; surface.

Tracheloteuthis sp.

South Pacific Ocean, 20° W. of Patagonia, November 6, 1875; lat. 37° 50′ S., long. 93° 54′ W.

Cirroteuthis sp.

Station 298.—Off Valparaiso, November 17, 1875; lat. 34° 7′ S., long. 73° 56′ W.; 2225 fathoms; blue mud; bottom temperature, 35°·6; surface temperature, 59°. Trawl.

Cirroteuthis magna, n. sp. | *Eledone rotunda*, n. sp.

From the surface near the same locality.

Tracheloteuthis sp.

Station 313.—Off Cape Virgins, Patagonia, January 20, 1876; lat. 52° 20′ S., long. 67° 39′ W.; 55 fathoms; sand; bottom temperature, 47°·8; surface temperature 48°·2. Trawl.

Rossia sublevis (?). | *Rossia patagonica*.

Loligo ellipsura, n. sp.

Station 320.—Off Monte Video, February 14, 1876; lat. 37° 17′ S., long. 53° 52′ W.; 600 fathoms; green sand; bottom temperature, 37°·2; surface temperature, 67°·5. Trawl.

Eledone brevis, n. sp.

Station 321.—Off Monte Video, February 25, 1876; lat. 35° 2′ S., long. 55° 15′ W.; 13 fathoms; mud; surface temperature, 73°·5. Trawl.

Loligo brasiliensis.

Station 333.—Mid-South Atlantic, March 13, 1876; lat. 35° 36′ S., long. 21° 12′ W.; 2025 fathoms; Globigerina ooze; bottom temperature, 35°·3; surface temperature, 67°. Trawl.

Histiopsis atlantica, n. gen., n. sp.

South Atlantic, March 21, 1876; lat. 21° 15′ S., long. 14° 2′ W.; surface temperature at noon, 76°·5.

Grenacher's pelagic larva.

Ascension, March 27–April 3, 1876.

Octopus occidentalis, n. sp.

North Atlantic, April 12, 1876; lat. 9° 3′ N., long. 16° 35′ W.; surface temperature at noon, 81°·7. Surface.

Onychoteuthis sp.

North Atlantic, April 13, 1876; lat. 10° 48′ N., long. 17° 48′ W.; surface temperature at noon, 78°·5. Surface.

Taonius suhmi, n. sp.

St. Vincent, Cape Verde Islands, April 25, 1876; 15 to 20 fathoms.

Octopus granulatus.

North Atlantic, April 28, 1876; lat. 17° 47′ N., long. 28° 28′ W.; tow-net at night, surface; surface temperature at midnight, 73°.

Tremoctopus quoyanus.

North Atlantic, April 29, 1876; lat. 18° 8′ N., long. 30° 5′ W.; surface temperature at midnight, 73°·7. Surface at night.

Ommastrephes sp. | *Spirula peronii* (shells).

H.M.S. "Porcupine" Expedition, 1869.

Station 57.—Færöe Channel, cold area; lat. 60° 14′ N., long. 6° 17′ W.; 632 fathoms; bottom temperature, 30°·5.

Octopus arcticus.

Station 65.—Færöe Channel, cold area; lat. 61° 10′ N., long. 2° 21′ W.; 345 fathoms; bottom temperature, 29°·8.

Octopus arcticus. | *Rossia glaucopis.*

The Minch, west coast of Scotland; 60 to 80 fathoms.

Sepiola rondeleti. | *Rossia oweni.*

Off Wexford.

Rossia oweni. | *Eledone cirrosa.*

North Atlantic, about 140 miles north-west of the Irish coast; July 2, 1869; lat. 56° 10′ N., long. 13° 36′ W. Surface.

Taonius hyperboreus.

"Valorous" Expedition.

South west of Cape Farewell, Greenland, August 15, 1875; lat. 58° 45′ N., long. 48° 39′ W. Surface.

Gonatus fabricii.

East of Cape Farewell; lat. 59° 16′ N., long. 37° 16′ W.

Gonatus fabricii.

H.M.S. "KNIGHT ERRANT" EXPEDITION.

STATION 2.—Færöe Channel, cold area, July 28, 1880; lat. 60° 29′ N.; long. 8° 19′ W.; 375 fathoms; mud; bottom temperature, 31°·0; surface temperature, 53°.

Tracheloteuthis riisei.

STATION 8.—Færöe Channel, cold area, August 17, 1880: lat. 60° 3′ N., long. 5° 51′ W.; 540 fathoms; ooze; bottom temperature, 29°; surface temperature, 56°·5.

Octopus piscatorum. | *Octopus arcticus.*

H.M.S. "TRITON" EXPEDITION.

Færöe Channel, August 8, 1882; surface.

Tracheloteuthis sp.

STATION 9.—Færöe Channel, cold area, August 23, 1882; lat. 60° 5′ N., long. 6° 21′ W.; 608 fathoms; mud; bottom temperature, 30°.

Octopus piscatorum. | *Octopus arcticus.*

Off the Butt of Lewis, August 25, 1882; 40 fathoms.

Eledone cirrosa. | *Rossia oweni.*

The preceding list is a more than usually valuable one, not only because of the care with which all the localities were recorded, but also because of the accuracy with which the various physical conditions were determined at the different stations.

From a faunistic point of view, however, it is obviously very incomplete, owing to the fact that collecting in shallow water, where Cephalopods are certainly most abundant, formed a comparatively small part of the work of the Expedition, and partly also because it was from the very nature of the case impossible that any one voyage, however protracted, should explore more than a very small portion of the sea. Such being the case, and seeing that, so far as I am aware, no attempt has hitherto been made to give a complete survey of the existing species of this group arranged geographically,

I have collected whatever information the specimens in my hands and the literature of the subject afforded in the subjoined lists.

As regards their distribution the Cephalopoda seem to be divisible into three principal groups (1) the Pelagic, (2) the Littoral, (3) the Abyssal, and the different genera belong with considerable constancy to one group or the other, that is to say, all the species of any one genus belong to the same group; for example—*Octopus*, *Sepia*, and *Loligo* are typical littoral genera, while *Cranchia*, *Ommastrephes*, and *Onychoteuthis* are with equal distinctness pelagic in their habits.

It has been stated generally, and the examination of the Challenger collection has certainly borne out the proposition, that while pelagic animals belong to but few types, each of which has a comparatively wide area of distribution, littoral forms belong to many species, each of which is confined within narrow limits. With reference to deep-sea forms our knowledge is only in its infancy, but they seem to be even more widely distributed than the pelagic ones; and conditions of life in the depths of the sea (especially temperature) are so uniform that this is precisely what we should expect, and what has been found to obtain in other groups.

The first three lists give what I may call the "Oceanic" species, using this word to include both the pelagic and abyssal forms, for it is convenient to consider them together as regards their horizontal distribution: their vertical distribution will be treated of in the next section of this Report. These forms have been disposed in three groups corresponding to the Atlantic, Pacific, and Indian (including the Southern) Oceans rather for convenience than from a belief that such a division is natural; although, as will appear subsequently (p. 222), the great majority are confined to one area. The chief factor limiting their dispersion being probably temperature, though doubtless other conditions, such as the presence of Gulf weed, also have their influence.

The "Littoral" species, that is those found in moderately shallow water not far from the coasts, whether they be active swimmers like *Loligo*, or more sedentary like *Octopus*, are much more restricted in their range than the oceanic. For the purpose of representing their distribution, the coasts of the world have been divided into seventeen regions, which are very different in extent and in the number of species that have been recorded from them; as regards the former of these points it may be remarked that no sharp boundaries can be drawn between them at all; for, although for statistical purposes it may be necessary to adopt lines of demarcation, these are not recognised by nature, and furthermore a fuller knowledge of the faunas of the various regions would almost certainly show that some of the districts here proposed should be subdivided and others united.

The geographical regions here adopted agree very closely with those proposed by Dr. Paul Fischer in his recent Manual, based upon a study of the whole of the Mollusca. In a few cases I have subdivided his districts, in more he has subdivided

mine. The subjoined comparative scheme shows approximately the relations of the different divisions :—

Fischer.		Hoyle.
1. Arctique,		XVII. Arctic.
2. Boréale, 3. Celtique,		I. Scandinavian.
4. Lusitanienne,	=	IV. Lusitanian. V. Mediterranean.
5. Aralo-caspienne,		
6. Africaine occidentale,		VI. West African.
7. Africaine australe,		VII. South African.
8. Indo-pacifique,		VIII. Red Sea. IX. Indo-Malay. XIII. Insular Pacific.
9. Australo-zélandaise,		XI. Australian. XII. New Zealand.
10. Japonaise,		X. Japanese.
11. Aleutienne, 12. Californienne, 13. Panamique,		XIV. Californian.
14. Péruvienne,		XV. Peruvian.
15. Magellanique, 16. Patagonienne,		XVI. Patagonian.
17. Caraïbe,		III. West Indian.
18. Transatlantique,		II. New England.

The geographical position of each region will be indicated in the sequel, and is shown upon the accompanying map; the boundary between the littoral regions and the oceanic provinces has been taken at the 500 fathom line for the abyssal forms; as regards the pelagic forms obviously no line can be drawn, for most characteristic oceanic surface forms are not unfrequently found quite near to the coast.

When a species has been recorded from more than one region the letter or number corresponding to each additional region is placed after its name; † indicates that the species is recorded from that province in the present Report.

OCEANIC SPECIES.

A. The Atlantic Oceanic Region.

Cirroteuthis umbellata.
„ *plena.*
„ *megaptera.*
Stauroteuthis syrtensis (also II.).
Opisthoteuthis agassizii (also II. III.).
Argonauta argo (also C. II. IV. V. VII. IX. XI.).
Argonauta hians (also C. IX.).
† *Tremoctopus quoyanus* (also C.).
† „ *atlanticus.*
„ *microstomus* (also V.).
„ *hyalinus.*
† *Allopsus mollis* (also II.).
Octopus lentus (also II.).

† *Octopus piscatorum* (also I. II.).
† „ *arcticus* (also I. II.).
„ *gracilis*.
„ *brevipes* (also C.).
Eledone verrucosa (also C. II.).
† „ *brevis*.
Eledonella pygmæa.
† *Japetella prismatica*.
Bolitæna microcotyla.
Sepiola pusilla.
Rossia megaptera (also II.).
Ommastrephes bartramii (also B. II. V.).
„ *pteropus* (also I. V.).
„ *pelagicus* (also III.).
Todarodes sagittatus (also I. IV. V.).
Illex illecebrosus (also II.).
† *Tracheloteuthis riisei* (also V. XIII.).
Architeuthus monachus.
„ *dux* (also I.).
„ *harveyi* (also II.).
„ *princeps* (also II.).
Bathyteuthis megalops.
Steenstrupiola atlantica.
† *Mastigoteuthis agassizii*.
Enoploteuthis leptura (also C.).
„ *pallida*.
Ancistrocheirus megaptera.
Abralia morisii.
Onychoteuthis banksii (also B. C. XII.).
† *Teleoteuthis caribbæa* (also C.).
† *Gonatus fabricii* (also C. II. V. XVII.).
Doratopsis diaphana.
Cheiroteuthis bonplandi.
„ *lacertosa* (also II.).
Brachioteuthis beanii (also II.).
Calliteuthis reversa (also II. X.).
† *Histiopsis atlantica*.
Cranchia scabra (also III.).
„ *megalops*.
† „ *reinhardtii*.
„ *maculata*.
Taonius pavo (also II.).
† „ *hyperboreus* (also II. XVII.).
„ *cymoctypus*.
† „ *suhmi* (also B. C.).
Leachia cyclura (also B. C.).
Leachia ellipsoptera.

B. The Indian and Southern Oceanic Region.

† *Cirroteuthis magna* (also C.).
† *Eledone rotunda* (also C.).
Sepiadarium kochii.
Idiosepius pygmæus (also IX.).
Ommastrephes bartramii (also A. II. V.).
„ *oualaniensis* (also C.).
Tracheloteuthis behnii (also C. IX.).
† *Bathyteuthis abyssicola*.
Abralia armata.
Onychoteuthis banksii (also A. C. XII.).
Ancistroteuthis dussumieri.
Teleoteuthis platypera (also C.).
„ *peratoptera* (also C.).
† *Taonius suhmi* (also A. C.).
Leachia cyclura (also A. C.).

C. The Pacific Region.

† *Cirroteuthis magna* (also B.).
† „ *meangensis*.
† „ *pacifica*.
† *Amphitretus pelagicus*.
† ? *Tremoctopus gracilis*.
† „ *quoyanus* (also A.).

Argonauta argo (also A. II. IV. V. VII. IX. XI.).
„ *tuberculata* (also VII. IX. XI. XII.).
„ *hians* (also A. IX.).
† ? *Octopus brevipes* (also A.).
„ *januarii* (also III.).
† *Eledone verrucosa* (also A. II.).
† „ *rotunda* (also B.).
† *Eledonella diaphana*.
† *Promachoteuthis megaptera*.
Loliolus affinis.
Ommastrephes gigas.
† „ *oualaniensis* (also B.).
Todarodes sloanii (also XII.).
Tracheloteuthis behnii (also B. IX.).
Enoploteuthis leptura (also A.).
† „ *margaritifera* (also V.).
Cucioteuthus unguiculatus.
Ancistrocheirus leseurii.
Onychoteuthis banksii (also A. B. XII.).
„ *æquimana*.
† ? *Teleoteuthis caribbæa* (also A.).
„ *platyptera* (also B.).
„ *peratoptera* (also B.).
Gonatus fabricii (also A. II. V. XVII.).
† *Taonius suhmi* (also A. B.).
Leachia cyclura (also A. B.).

LITTORAL SPECIES.

I. The Scandinavian Region.

This region includes the whole of the Scandinavian Peninsula, Denmark, Holland, Iceland, and the northern half of the British Isles.

Octopus vulgaris (also III. IV. V. VI. VII. VIII. IX. X. XIII.).
† „ *piscatorum* (also A. II.).
† „ *arcticus* (also A. II. XVII.).
† *Eledone cirrosa* (also IV. V.).
† *Sepiola rondeleti* (also IV. V. VI.).
„ *atlantica* (also XVII.).
? *Rossia macrosoma* (also V. XVII.).
† „ *oweni*.
† „ *glaucopis* (also XVII.).
Sepia officinalis (also IV. V. VI.).
Loligo vulgaris (also IV. V.).
„ *forbesii* (also IV.).
„ *breviceps*.
„ *media* (also IV. V.).
Ommastrephes pteropus (also A. V.).
Todarodes sagittatus (also A. IV. V.).
Illex coindetii (also IV. V.).
Architeuthus monachus (also A.).
„ *dux* (also A.).

II. The New England Region.

The northern boundary of this region I am unable to fix, probably it extends up to the coast of Labrador; southwards it extends about as far as Cape Hatteras.

Stauroteuthis syrtensis (also A.).
Opisthoteuthis agassizii (also A. II.).
Argonauta argo (also A. C. IV. V. VII. IX. XI.).
Ocythoë tuberculata (also V.).
Alloposus mollis (also A.).
Octopus lentus (also A.).
„ *obesus*.

Octopus piscatorum (also A. I.).
„ *arcticus* (also A. I. XVII.).
? „ *carolinensis.*
Eledone verrucosa (also A. C.).
Stoloteuthis leucoptera.
Rossia hyatti.
„ *sublevis* (also XVI.).
† *Rossia tenera* (also III.).
„ *megaptera* (also A.).
Loligo pealei.
Lolliguncula brevis (also III.).
Ommastrephes bartramii (also A. B. V.).
Ommastrephes megapterus.
Illex illecebrosus (also A.).
Architeuthus harveyi (also A.).
„ *princeps* (also A.).
Gonatus fabricii (also A. C. V. XVII.).
Teleoteuthis agilis.
Chiroteuthis lacertosa (also A.).
Brachioteuthis beanii (also A.).
Calliteuthis reversa (also A. X.).
Histioteuthis collinsii.
Taonius pavo (also A.).
Taonius hyperboreus (also A. XVII.).

III. The West Indian Region.

This province extends southwards from the last, about as far as the mouth of the Rio de la Plata, and includes the Gulf of Mexico and the shores of the islands at its mouth.

Opisthoteuthis agassizii (also A. II.).
Octopus vulgaris (also I. IV. V. VI. VII. VIII. IX. X. XIII.).
„ *occidentalis* (also VI.).
„ *tuberculatus* (also V. VI.).
„ *granulatus* (also IV. VI. VII. IX. XV.).
† „ *tehuelchus* (also XVI.).
„ *verrilli.*
† „ *bermudensis.*
† „ *januarii* (also C.).
„ *filosus.*
Nectoteuthis pourtalesii.
Rossia brachyura.
Rossia tenera (also II.).
Spirula peronii (also IX. XI.).
Sepia antillarum.
Sepioteuthis sepioidea.
„ *ehrhardti.*
„ *ovata.*
„ *sloanii.*
† *Loligo brasiliensis.*
„ *gahi* (also XV. XVI.).
„ *plei.*
Lolliguncula brevis (also II.).
Ommastrephes pelagicus (also A.).
Abralia megalops.
Cranchia scabra (also A.).
Cranchia tenuitentaculata.

IV. The Lusitanian Region.

This region includes the southern half of the British Isles, the coasts of France, Spain and Africa, about as far as the Canary Islands. It is, of course, closely related to the Mediterranean Region, but that sea contains so many forms which appear to be peculiar to it that it appeared best to regard it provisionally as a distinct region.

Argonauta argo (also A. C. II. V. VII. IX. XI.).
Octopus vulgaris (also I. III. V. VI. VII. VIII. IX. X. XIII.).
„ *granulatus* (also III. VI. VII. IX. XV.).
Eledone cirrosa (also I. V.).
Sepiola rondeleti (also I. V. VI.).
„ *atlantica*.
Sepia officinalis (also I. V. VI.).
„ *filliouxi* (also V.).
„ *fischeri*.
Sepia orbignyana (also V.).
„ *ruppellaria* (also V.).
Loligo vulgaris (also I. V.).
„ *affinis*.
„ *macrophthalma*.
„ *microcephala*.
„ *moulinsi*.
„ *forbesii*.
„ *media* (also I. V.).
Ommastrephes crassus.
Todarodes sagittatus (also A. I. V.).
Illex coindetii (also I. V.).

V. The Mediterranean Region.

The Mediterranean and Black Seas make up this region. Strictly speaking, here also a subdivision should be made, like that adopted in regard to the oceans, separating the pelagic from the littoral forms; but the distinction does not seem to be so clearly marked, perhaps owing to the subject not having been sufficiently investigated.

Argonauta argo (also A. C. II. IV. VII. IX. XI.).
Ocythoë tuberculata (also II.).
Tremoctopus violaceus.
„ *microstomus* (also A.).
„ *ocellatus*.
? *Octopus vulgaris* (also I. III. IV. VI. VII. VIII. IX. X. XIII.).
„ *salutii*.
„ *tuberculatus* (also III. VI.).
„ *de filippi*.
„ *macropus* (also VI. VIII. IX. X.).
„ *alderii*.
Scæurgus tetracirrhus.
„ *titanotus*.
„ *unicirrus*.
Eledone moschata.
„ *cirrosa* (= *Eledone aldrovandi*) (also I. IV.).
Sepiola rondeleti (also I. IV. VI.).
? „ *oweniana* (also XIII.).
Rossia macrosoma (also I. XVII.).
Heteroteuthis dispar.
Sepia officinalis (also I. IV. VI.).
„ *filliouxi* (also IV.).
„ *orbignyana* (also IV.).
„ *elegans*.
„ *ruppellaria* (also IV.).
Loligo vulgaris (also I. IV.).
„ *media* (also I. IV.).
Thysanoteuthis rhombus.
„ *elegans*.
Ommastrephes bartramii (also A. B. II.).
? „ *æquipodus*.
„ *pteropus* (also A. I.).
Todarodes sagittatus (also A. I. IV.).
Illex coindetii (also I. IV.).

Dosidicus eschrichtii.
Tracheloteuthis riisei (also A. XII.).
Abralia polyonyx.
„ *veranyi.*
„ *oweni.*
Enoploteuthis margaritifera (also C.).
Verania sicula.
Ancistroteuthis lichtensteinii.
Teleoteuthis krohnii.
Gonatus fabricii, (also A. C. II. XVII.).
Chiroteuthis veranyi.
Histioteuthis bonelliana.
„ *ruppelli.*
Doratopsis vermicularis.

VI. The West African Region.

The district thus named extends from the Canaries to about the Tropic of Capricorn.

Octopus vulgaris (also I. III. IV. V. VII. VIII. IX. X. XIII.).
„ *tuberculatus* (also III. V.).
† „ *occidentalis* (also III.).
† „ *granulatus* (also III. IV. VII. IX. XV.).
Octopus macropus (also V. VIII. IX. X.).
Sepiola rondeleti (also I. IV. V.).
Sepia officinalis (also I. IV. V.).
„ *hierredda.*
„ *bertheloti.*
Sepiella ornata.

VII. The South African Region.

A considerably greater area has been allotted to this province than is given to the corresponding one in Dr. Fischer's arrangement. It has been allowed to extend from the Cape as far as the Red Sea and to include the Madagascar and Mauritius, as well as the islands of the South Atlantic and Southern Oceans, the Tristan and Prince Edward groups, with the Kerguelen and Heard Islands.

† *Argonauta argo* (also A. C. II. IV. V. IX. XI.).
„ *tuberculata* (also C. IX. XI. XII.).
Octopus vulgaris (also I. III. IV. V. VI. VIII. IX. X. XIII.).
† „ *verrucosus.*
† „ *granulatus* (also III. IV. VI. IX. XV.).
? „ *horridus* (also VIII.).
„ *aranea* (also XIII.).
„ *levis.*
Cistopus indicus (also IX.).
Sepiola stenodactyla.
Sepia vermiculata.
„ *zanzibarica.*
„ *venusta.*
„ *capensis.*
„ *tuberculata.*
Hemisepius typicus.
Sepioteuthis mauritiana.
„ *loliginiformis* (also VIII.).
„ *madagascariensis.*
Loligo reynaudii.
Monchezia sancti-pauli.
Enoploteuthis hoylei.
Pyrgopsis rhynchophorus.
Taonius (?) *maximus.*

VIII. The Red Sea.

This has been separated as a distinct region, since it seems to contain several peculiar forms.

Octopus vulgaris (also I. III. IV. V. VI. VII. IX. X. XIII.).
„ *horridus* (also VII.).
„ *macropus* (also V. VI. IX. X.).
Sepia savignyi.
Sepia rouxii (also IX.).
„ *elongata.*
„ *lefebrei.*
„ *gibbosa.*
Sepioteuthis loliginiformis (also VII.).
Loligo arabica.

IX. The Indo-Malayan Region.

This province I regard as extending from the Red Sea eastward and northward somewhat further than the Island of Formosa, and as including the Philippines, Papua and all the Malay Archipelago. Probably a portion of the northern coast of Australia should be added, as is done by Fischer, but of this I am not certain.

Argonauta argo (also A. C. II. IV. V. VII. IX. XI.).
„ *tuberculata* (also C. VII. XI. XII.).
„ *hians* (also A. C.).
Octopus vulgaris (also I. III. IV. V. VI. VII. VIII. X. XIII.).
„ *granulatus* (also III. IV. VI. VII. XV.).
† „ *areolatus* (also X.).
„ *aculeatus* (also XIII.).
„ *macropus* (also V. VI. VIII. X.).
† „ *bandensis.*
„ *membranaceus.*
„ *punctatus* (also X. XIV.).
Cistopus indicus (also VII.).
Sepiola schneehageni.
„ *rossiæformis.*
„ *penares.*
Idiosepius pygmæus (also B.).
† *Spirula peronii* (also III. XI.).
† *Sepia smithi.*
† „ *papuensis.*
„ *pagenstecheri.*
„ *singaporensis.*
„ *latimanus* (also XI.).
„ *aculeata.*
„ *indica* (also XI.).
„ *rostrata* (also XI.).
„ *rouxii* (also VIII.).
† „ *elliptica.*
„ *brevimana.*
† „ *recurvirostra.*
† „ *sulcata.*
† „ *kiensis.*
† „ *pfefferi.*
„ *brachycheira.*
Sepiella inermis.
„ *curta.*
„ *ocellata.*
„ *maindroni* (also X.).
Sepioteuthis blainvilliana.
„ *neoguinaica.*

† *Sepioteuthis lessoniana* (also X. XII. XIII.).
Loligo sumatrensis.
„ *duvaucelii.*
† „ *indica.*
Loligo subalata.
† „ *galatheæ.*
Tracheloteuthis behnii (also B. C.).
Teleoteuthis curta.
Cranchia brockii.

X. The Japanese Region.

The coasts of these islands have yielded so many remarkable Cephalopods that it seems advisable to separate them, provisionally at all events, as a distinct region.

Octopus vulgaris (also I. III. IV. V. VI. VII. VIII. IX. XIII.).
„ *areolatus* (also IX.).
† „ *macropus* (also V. VI. VIII. IX.).
„ *globosus.*
† „ *punctatus* (also IX. XIV.).
Inioteuthis japonica.
† „ *morsei.*
? *Sepia myrsus.*
† „ *esculenta.*
„ *andreana.*
„ *peterseni.*
† „ *andreanoides.*
† *Sepia kobiensis.*
„ *tullbergi.*
† *Sepiella maindroni* (also IX.).
Sepioteuthis lessoniana (also IX. XII. XIII.).
„ *brevis.*
† *Loligo kobiensis.*
„ *bleekeri.*
† „ *chinensis.*
† „ *edulis.*
† „ *japonica.*
† *Todarodes pacificus.*
† *Calliteuthis reversa* (also A. II.).
Calliteuthis ocellata.

XI. The Australian Region.

The whole Australian continent is here regarded as forming a single region; as above remarked it is quite probable that the northern portion of it should be placed in the last division, but so little information regarding the species from that district has come into my hands that I forbear from drawing any line. Fischer makes an arbitrary boundary at the Tropic of Capricorn.

Argonauta argo (also A. C. II. IV. V. VII. IX.).
„ *tuberculata* (also C. VII. IX. XII.).
Octopus boscii.
† „ „ var. *pallida.*
Octopus tetricus.
„ *superciliosus.*
† „ *australis.*
„ *tenebricus.*
† „ *duplex.*
† „ *pictus.*

† *Octopus pictus*, var. *fasciata*.
„ *polyzenia*.
„ *cornutus*.
Sepiola tasmanica.
Sepioloidea lineolata.
Spirula peronii (also III. IX.).
Sepia plangon.
„ *latimana* (also IX.).
„ *indica* (also IX.).
„ *rostrata* (also IX.).
Sepia australis.
„ *mestus*.
† „ *cultrata*.
„ *apama* (also XII.).
„ *palmata*.
Sepioteuthis australis.
„ *lunulata* (also XII.).
Loligo australis.
Nautilus stenomphalus.
Nautilus pompilius (also XIII.).

XII. The New Zealand Region.

The Cephalopod fauna of these islands is so peculiar that it seems advisable to separate them from the Australian region, to which they are no doubt nearly allied, though, as will be seen above, the number of forms proved to be common to both is very few.

Argonauta tuberculata (also C. VII. IX. XI.).
„ *gracilis*.
Octopus maorum.
„ *communis*.
Pinnoctopus cordiformis.
Sepiola pacifica.
Sepia apama (also XI.).
Sepioteuthis bilineata.
„ *lessoniana* (also IX. X. XIII.).
Todarodes sloanii (also C.).
Onychoteuthis banksii (also A. B. C.).

XIII. The Pacific Insular Region.

The shores of the various archipelagos in the Pacific Ocean seem to be inhabited by numerous Cephalopods which are quite distinct from the pelagic forms inhabiting the open ocean. But few collections have as yet been made of these; not enough to enable any general conclusions regarding their affinities to be drawn.

? *Octopus vulgaris* (also I. III. IV. V. VI. VII. VIII. IX. X.).
† „ *tonganus*.
† „ *vitiensis*.
† „ *marmoratus*.
„ *aculeatus* (also IX.).
Octopus hawaiensis.
„ *aranea* (also VII.).
„ *lunulatus*.[1]
? *Sepiola oweniana* (also V.).
Sepia polynesica.

[1] Hutton (Man. Moll. N. Zeal., p. 1) has corrected d'Abigny's statement that this species is from New Zealand; Quoy and Gaimard say, "le havre Carteret à la Nouvelle Irlande."

Sepioteuthis lunulata (also XI.).
† „ *lessoniana* (also IX. X. XII.).
Loligo pfefferi.
„ *spectrum.*
Tracheloteuthis riisei (also A. V.).
Nautilus pompilius (also XI.).
„ *scrobiculatus.*
„ *macromphalus.*
„ *umbilicatus.*

XIV. The Californian Region.

This region I regard as stretching from the peninsula of Alaska to the Isthmus of Panama; probably it will eventually be necessary to subdivide it, but so few forms have been described from that coast, that this course hardly seems advisable at present. From the coast between Alaska and Kamtschatka no Cephalopods are known to me; probably they will be found like the other Mollusca from that region to be of Arctic types.

Argonauta pacifica.
„ *expansa.*
Octopus bimaculatus.
Octopus punctatus (also IX. X.).
Loliolus steenstrupi.
Onychoteuthis lobipennis.
Ancistroteuthis robusta.

XV. The Peruvian Region.

The northern boundary of this province may be taken at the Isthmus of Panama and the southern at about the northern limit of Patagonia.

Octopus granulatus (also III. IV. VI. VII. IX.).
„ *fontanianus* (also XVI.).
Loligo gahi (also III. XVI.).
Steenstrupiola chilensis.[1]
Onychoteuthis brachyptera.[1]
Taonius schneehageni.[1]

XVI. The Patagonian Region.

This region includes the extremity of South America, both on the eastern and western coasts.

Octopus fontanianus (also XV.).
„ *tehuelchus* (also III.).
† *Rossia patagonica.*
Rossia sublevis (also II.).
Loligo gahi (also III. XV.).
„ *patagonica.*
Onychoteuthis ingens.

[1] Probably these species are Oceanic.

XVII. The Arctic Region.

The coasts of Greenland, Spitzbergen, and the seas within the Arctic circle, so far as they have been explored, constitute this region.

Cirroteuthis mülleri.	*Rossia palpebrosa.*
Octopus arcticus[1] (also A. I. II.).	„ *glaucopis* (also I.).
Sepiola atlantica (also I.).	„ *mölleri.*
Rossia macrosoma[2] (also I. V.).	*Gonatus fabricii* (also A. C. II. V.).

Taonius hyperboreus (also A. II.).

The general statements above made may be tested by reference to these statistical tables.

The species enumerated in the Oceanic lists are distributed thus :—

66	species are recorded	from	only one Oceanic area.
15	„	„	two Oceanic areas.
3	„	„	three „

These numbers show that about 75 per cent. of the oceanic forms are confined to one ocean, and that cosmopolitan forms must be regarded as exceptional.

The species enumerated in the seventeen Littoral lists may be arranged thus :—

199	species are recorded	from	only one Littoral area.
27	„	„	two Littoral areas.
12	„	„	three „
4	„	„	four „
1	„	„	five. „
2	„	„	six „
1	„	„	ten „

About 80 per cent. therefore of these forms are confined to one region, a striking confirmation of the proposition made on p. 211.

Thirty-five species are recorded from both Oceanic and Littoral regions, but the majority of these are typically pelagic, and hence their occurrence in the latter areas must be regarded as accidental; furthermore it will be seen that almost without exception the littoral regions where a species has been found are those bordering upon its proper ocean, which is precisely what would have been expected.

[1] Recorded by Dewhurst as *Sepia grœnlandica* (Nat. Hist. Cetacea, p. 263, London, 1834), and by Møller as *Octopus granulatus* (Ind. Moll. groenl., p. 3). Most of the species enumerated above occur in Mörch's list in Rink, Danish Greenland, p. 440, London, 1877.

[2] This is more likely to be *Rossia oweni.*

The most remarkable instances of wide distribution are *Octopus macropus* (from five regions), *Octopus granulatus* and *Argonauta argo* (each from six), and *Octopus vulgaris* (from ten regions); but with regard to each of these it is probable that other species have been recorded under the names of the better known ones. This is more especially likely in the last instance, for the specific name *vulgaris* seems to impress certain minds with the idea that the commonest form in all regions must be referable to it.

The genus *Sepia*, in contradistinction to *Octopus* and *Loligo* which are cosmopolitan, presents us with a very interesting case of wide but yet definitely limited distribution. The different distributional regions contain the following numbers of species:[1]—

I. Scandinavian,	1	X. Japanese,	9
II. New England,	0	XI. Australian,	9
III. West Indian,	1	XII. New Zealand,	1
IV. Lusitanian,	5	XIII. Pacific Insular,	1
V. Mediterranean,	5	XIV. Californian,	0
VI. West African,	4	XV. Peruvian,	0
VII. South African,	5	XVI. Patagonian,	0
VIII. Red Sea,	5	XVII. Arctic,	0
IX. Indo-Malayan,	19		

From this summary it appears, in the first place, that the whole American continent is devoid of any species of this genus, and that from the islands only one species has been recorded and that a very doubtful one (*Sepia antillarum*, d'Orb.). The opposite hemisphere, however, is just as rich in species as this one is poor, and the greatest abundance is seen to be in the Indo-Malayan region, from which no less than nineteen forms have been recorded, while the remaining districts seem to contain fewer types pretty nearly in proportion as they are removed from this centre; thus Japan and Australia each have nine; the Red Sea, South Africa and the Mediterranean each five, while the Scandinavian region has only one. The conclusion is most forcibly suggested that this genus was first developed in this part of the world and has gradually spread, *Sepia antillarum* being as it were a pioneer leading the way to the occupation of the Western Hemisphere.

An interesting correspondence has often been remarked between the Scandinavian and New England regions; Verrill has called attention to it as regards the Mollusca as a whole, and I have elsewhere given a comparison between the Ophiuroidea from the two sides of the Atlantic.[2] As regards the Cephalopoda the resemblance between the two faunas is not striking, especially at first sight, only *Octopus piscatorum* and *Octopus arcticus* being actually common to the two; but it must be remembered that several of the species of *Rossia* resemble each other closely (*e.g.*, *Rossia glaucopis* of the European, and *Rossia hyatti* of the American waters), while there is no doubt that *Illex illecebrosus* and *Illex coindetii* are very nearly allied to each other. This resemblance

[1] Species of the genus *Sepiella* are here included.

[2] *Proc. Roy. Soc. Edin.*, vol. xii. p. 727, 1884.

is rendered less strange by the considerations, that it is most marked in the case of the species from deep and cold water, and that the faunas of both sides of the Atlantic are similarly related to the forms from the Arctic Ocean (compare regions I., II., and XVII.).

An apparent resemblance, less easy to account for, if it be found really to exist, is that between the Western Pacific and the Western Atlantic, to which allusion has already been made in the pages of this Report (pp. 105, 107, 184). A number of identical or allied species are common to both, as may be seen from the subjoined list :—

Western Atlantic.	Western Pacific.
Cirroteuthis plena.	*Cirroteuthis magna.*
„ *megaptera.*	„ *meangensis.*
	„ *pacifica.*
Octopus januarii, ...	*Octopus januarii.*
Eledone verrucosa, ...	*Eledone verrucosa.*
Eledonella pygmæa, ...	*Eledonella diaphana.*
Calliteuthis reversa, ...	*Calliteuthis reversa.*

It is possible that this resemblance may, upon further examination, prove to be delusive. *Cirroteuthis* is a genus whose members appear to be rather widely distributed in deep water; and *Eledone verrucosa* and *Octopus januarii* seem to be inhabitants of moderately deep water, and will perhaps be dredged up from intermediate points, while *Eledonella* is probably a pelagic genus, and if so is of no weight whatever in the consideration of distributional problems. It seemed worth while, however, to state the facts clearly as at present known, if only for the sake of directing attention to them.

A relation between the marine faunas of Japan and Western Europe has been pointed out in the case of fish by Dr. Günther, and in the case of mollusca by the late Dr. Gwyn Jeffreys,[1] but the study of the Cephalopoda has not made any additions to the list of common forms. A matter of interest in this connection, however, is the capture of specimens of *Enoploteuthis* in the Malay Archipelago and in the Pacific, which I see no reason for distinguishing from the *Enoploteuthis margaritifera* of the Mediterranean; a fact which suggests the possibility of a connection having taken place between the Mediterranean and the Indian Ocean, although, so far as it has yet been studied, the Cephalopod fauna of the Red Sea does not lend much support to this hypothesis. I understand, however, from Professor Geikie, that there is strong geological evidence in its favour, and, if so, the migration which has led to the existence of similar forms in the seas of Japan and Western Europe, may have taken place round the south, and not round the north of Asia as has generally been supposed.

[1] *Journ. Linn. Soc. Lond.*, vol. xii. pp. 100–109 ; see also Hoyle, *tom. cit. supra*, p. 717.

BATHYMETRICAL DISTRIBUTION.

Only slight materials are at present available for drawing any conclusions as to the Bathymetrical Distribution of the Cephalopoda. This is due, in the first place, to the fact that it is only quite recently that any record has been kept of the depth from which specimens were obtained, all our museums having considered it sufficient to indicate the localities of the various species.

Since the introduction of deep-sea dredging, however, a change in this respect has set in, but even yet the collections of the Challenger and of the United States Fish Commission and Coast Survey furnish by far the greater proportion of the accurate data available for discussion, although, no doubt, the investigations of the "Talisman" and "Travailleur" will furnish welcome additions when published.

Another consideration, however, greatly diminishes our real knowledge in this matter, and it is the fact, which has often been commented on in the present series of Reports, that it by no means follows that specimens procured necessarily inhabit the greatest depth reached by the dredge. In the case of animals so gifted with locomotor powers as the Cephalopoda it is peculiarly impossible to obtain certainty in this respect, and, consequently, every recorded instance of the occurrence of a member of this group in deep water requires to be discussed on its own merits, and by the aid of whatever collateral evidence may be available.

Before proceeding further it will be well to give, in a tabulated form, the information yielded by the Challenger collection, supplemented by whatever could be obtained from the literature of the subject or other trustworthy sources. No general statements, such as "shallow water," "moderate depths," have been admitted, but only those in which a definite number of fathoms was recorded; had the former been included the list of species found above the 100 fathom line would have been much more extensive.

The figures indicate the depth in fathoms, and the letters the sources of information; thus:—

Ch = Challenger collection.	**S** = Professor G. O. Sars.
K = "Knight Errant" collection.	**T** = "Triton" collection.
P = "Porcupine" collection (Expedition of 1869).	**V** = Professor Verrill.
	Val = "Valorous" collection.

The numbers enclosed in square brackets indicate recorded depths which are almost certainly erroneous.

Table I.—*Species recorded from the Surface.*

Species.	Challenger.	Other British Expeditions.	American Expeditions.	Other Sources and Remarks.	Also in Table
Amphitretus pelagicus, n. sp.,	[520]				
Argonauta argo,			V.		
Tremoctopus quoyanus,	Ch.				
,, *gracilis* (?),	Ch.				
,, *atlanticus*,	Ch.				
Alloposus mollis,	Ch.		V.	Dead.	I. IV. V. VI.
Octopus brevipes (?),	Ch.				
Eledonella diaphana, n. sp.,	[1100]				
Sepioteuthis lessoniana,	Ch.				
Ommastrephes bartramii,			V.	Recorded Ceph. N. E. Amer., p. 388.	
,, *oualaniensis*,	Ch.				
Todarodes sagittatus,				S.	
Illex illecebrosus,			V.		III. IV.
Teleoteuthis caribbæa,	Ch.			Lesr.	
,, *agilis*,			V.		
Gonatus fabricii,		Vol.		Steenstrup has shown reason for thinking that this form also occurs in the deep sea.	IV. V.
Chiroteuthis bonplandi,				Vérany.	
Cranchia reinhardtii,	[1850]			Stp.	
,, sp.,	Ch.				
Tavnius pavo,			V.		
,, *hyperboreus*,	[1250] Ch.	P.			IV. VI.
,, *suhmi*, n. sp.,	Ch.				VII. (?).

Table II.—*Species recorded from between the Surface and 50 fathoms.*

Species.	Challenger.	Other British Expeditions.	American Expeditions.	Other Sources and Remarks.	Also in Table
Octopus occidentalis, n. sp.,	n. rec.				
,, *tuberculatus*,	32				III.
,, *verrucosus*, n. sp.,	shore.				
,, *granulatus*,	15–20				
,, *boscii*, var. *pallida*, n.,	38				IV.
,, *tonganus*, n. sp.,	reefs.				
,, *vitiensis*, n. sp.,	reefs.				
,, *marmoratus*, n. sp.,	reefs.				
,, *australis*, n. sp.,	6–15				
,, *tehuelchus*,	8				

TABLE II.—*continued.*

Species.	Challenger.	Other British Expeditions.	American Expeditions.	Other Sources and Remarks.	Also in Table
Octopus arcticus,			7–47		III. IV. V.
„ *verrilli*,			27		III.
„ *pictus*, var. *fasciata*, n.,	6–15				
„ *bermudensis*, n. sp.,				Exact depth not recorded.	
„ *bandensis*, n. sp.,					
Eledone cirrosa,		40		T.	
Inioteuthis morsei,	8				
Rossia oweni,		40		T.	III.
„ *hyatti*,			7–49		III.
„ *sublevis*,			42–45		III. IV.
„ (?) *tenera*,			18–31		III. IV.
Sepia smithi, n. sp.,	28				
„ *papuensis*, n. sp.,	28				
„ *elliptica*, n. sp.,	28–49				
„ *kobiensis*, n. sp.,	8				
„ *pfefferi*, n. sp.,	28				
Sepiella maindroni (?),	12				
Loligo pealei,			1–50		
„ *brasiliensis*,	13				
„ *kobiensis*, n. sp.,	8–12				
„ *indica*,	28				
„ *galatheæ*, n. sp.,	20				
Todarodes pacificus,	12				

TABLE III.—*Species recorded from between* 50 *and* 100 *fathoms.*

Species.	Challenger.	Other British Expeditions.	American Expeditions.	Other Sources and Remarks.	Also in Table
Octopus tuberculatus (?),			69–84		II.
„ *arcticus*,			54–97	60–300 S.	II. IV. V.
„ *verrilli*,			69		II.
Sepiola rondeleti,		60–80 P.			
Stoloteuthis leucoptera,			94		IV.
Rossia oweni,		60–80 P.			II.
„ *glaucopis*,				60 S.	IV.
„ *hyatti*,			57–101		II.
„ *sublevis*,	53		54–100	Not repeated in Table IV.	II. IV.
„ (?) *tenera*,	85		57–85		II. IV.
„ *patagonica*,	53				
Loligo ellipsura, n. sp.,	53				
Illex illecebrosus,			51–100		I. IV.

TABLE IV.—*Species recorded from between* 100 *and* 500 *fathoms.*

Species.	Challenger.	Other British Expeditions.	American Expeditions.	Other Sources and Remarks.	Also in Table
Cirroteuthis meangensis, n. sp.,	500				V.
Stauroteuthis syrtensis,			250		V. VI.
Opisthoteuthis agassizii,			291		VI.
Alloposus mollis,			238–506		I. V. VI.
Octopus boscii, var. *pallida*, n.,	150				II.
„ *areolatus*,	140				
„ *carolinensis*,			142		
„ *duplex*, n. sp.,	150				
„ *lentus*,			120–464		V.
„ *obesus*,			150–300		
„ *piscatorum*,			120–200		V. VI.
„ *arcticus*,		345 P.	101–487	600–300 S.	II. III. V.
„ *januarii*, n. sp.,	350				VI.
Eledone verrucosa,			466		V. VI.
Stoloteuthis leucoptera,			110–388		III.
Nectoteuthis pourtalesii,			180		
Rossia glaucopis,		345 P.		200 S.	III.
„ *sublevis*,			101–458		II. III.
„ *brachyura*,			208		
„ *tenera*,			100–252		II. III.
„ *megaptera*,			150		V.
Spirula peronii,	360				V.
Sepia cultrata, n. sp.,	150				
„ *sulcata*, n. sp.,	140				
„ *kiensis*, n. sp.,	140				
Illex illecebrosus,			100–258		I. III.
Abralia megalops,			137–173		
Gonatus fabricii,			255–372		I. V.
Chiroteuthis lacertosa,			306–464		VI. VII.
Brachioteuthis beanii,			183–368		V.
Calliteuthis reversa,	345		365		V. VI. VII.
Histioteuthis collinsii,			180–372		
Taonius hyperboreus,			[388]		VI.
Nautilus pompilius,	315				

TABLE V.—*Species recorded from between* 500 *and* 1000 *fathoms.*

Species.	Challenger.	Other British Expeditions.	American Expeditions.	Other Sources and Remarks.	Also in Table
Cirroteuthis meangensis, n. sp.,	600				IV.
Stauroteuthis syrtensis,			523		IV. VI.
Amphitretus pelagicus, n. sp.,	[520]			Almost certainly from the surface.	
Alloposus mollis,			715		I. IV. VI.

TABLE V.—*continued.*

Species.	Challenger.	Other British Expeditions.	American Expeditions.	Other Sources and Remarks.	Also in Table
Octopus lentus,			603		IV.
„ *piscatorum*,		540, 608		K.E., T.	IV. VI.
„ *arcticus*,		540–632	524, 843	P., K.E., T.	II. III. IV.
Eledone verrucosa,	630		787–810		IV. VI.
„ *brevis*, n. sp.,	600				
Japetella prismatica, n. sp.,	[770]			Probably from surface.	
Rossia megaptera,			640		IV.
Spirula peronii,			950		IV.
Bathyteuthis megalops,			600		VI.
Mastigoteuthis agassizii,			647		VI. VII.
Ancistrocheirus megaptera,			707		
Gonatus fabricii,			715, 906		I. IV.
Brachioteuthis beanii,			843		IV.
Calliteuthis reversa,			906		IV. VI. VII.

TABLE VI.—*Species recorded from between* 1000 *and* 2000 *fathoms.*

Species.	Challenger.	Other British Expeditions.	American Expeditions.	Other Sources and Remarks.	Also in Table
Cirroteuthis magna, n. sp.,	1375				VII.
„ *plena*,			1073		
„ *megaptera*,			1054		VII.
Stauroteuthis syrtensis,			1346		IV. V.
Opisthoteuthis agassizii,			1054		IV.
Alloposus mollis,			1346–1735		I. IV. V.
Octopus piscatorum,			1362		IV. V.
„ *gracilis*,			1290		
„ *januarii*, n. sp.,	1875				IV.
Eledone verrucosa,			1050–1255		IV. V.
Eledone rotunda, n. sp.,	1950				VII.
Eledonella diaphana, n. sp.,	[1100]				
Promachoteuthis megaptera, n. sp.,	1875			Quite uncertain.	
Enoploteuthis margaritifera,	[1425]			Very doubtful.	VII.
Bathyteuthis abyssicola, n. sp.,	1600				
„ *megalops*,			1073		V.
Mastigoteuthis agassizii,	1945		1632		V. VII.
Doratopsis diaphana,			[1731]	Probably surface.	
Chiroteuthis lacertosa,			1022, 1309		IV. VII.
Calliteuthis reversa,			1346–1608		IV. V. VIII.
Cranchia reinhardtii,	[1850]			Surface almost beyond doubt.	
Taonius hyperboreus,	[1250]		[1346]	Almost certainly surface.	I. IV.

TABLE VII.—*Species recorded from between* 2000 *and* 3000 *fathoms.*

Species.	Challenger.	Other British Expeditions.	American Expeditions.	Other Sources and Remarks.	Also in Table
Cirroteuthis magna, n. sp., . .	2225				VI.
,, *pacifica*, n. sp., . .	2440				
,, *megaptera*, . .			2512, 2574		VI.
Eledone rotunda, n. sp., . .	2225				VI.
Eledonella pygmæa, . . .			[2949]		
Mastigoteuthis agassizii, . .			2515		V. VI.
Enoploteuthis margaritifera, . .	[2425]			Very doubtful.	VI.
Chiroteuthis lacertosa, . . .			2098, 2949		IV. VI.
Calliteuthis reversa, . . .			2369		IV. V. VI.
Histiopsis atlantica, n. sp., . .	2025			Possibly surface.	
Taonius suhmi, n. sp., . . .	[2150]			Surface.	I.

Some of the genera enumerated in the above list merit a brief discussion, and among these perhaps the most interesting is *Cirroteuthis*, whose remarkable history has already been alluded to (p. 55); the type species, described in 1836, was the only one known till 1883, since which time six species have been brought to our knowledge in addition to the two closely allied if not identical genera, *Stauroteuthis* and *Opisthoteuthis*. The following table gives all the particulars which have been published regarding the habitat of each of these forms, as well as the localities of some specimens too fragmentary for identification.

Species.	Locality.	Depth in Fathoms.	Temperature.		Remarks.
			Bottom ° F.	Surface ° F.	
Cirroteuthis mülleri, Eschricht,	Jakobshavn, Greenland.	...	...	...	No information as to depth.
,, *umbellata*, Fischer,	Off Azores and West Coast of Africa.	616 to 1206	...	...	
,, *magna*, Hoyle, .	Southern Ocean.	1375	35·6	43·0	
,, ,, . . .	Off Valparaiso.	2225	35·6	59·0	
,, *pacifica*, Hoyle, .	Between Papua and Australia.	2440	35·8	80·0	Station Book says "surface."
,, *meangensis*, Hoyle,	Off Meangis Islands, North of New Guinea.	500	41·8	80·5	
,, ,, . .	Off Kermadec Islands, South Pacific.	600	39·5	66·5	
,, sp.?, . . .	20° West of Patagonia.	...	...	...	Floating on surface, dead and mutilated.
,, *plena*, Verrill, .	5° East of Chesapeake Bay.	1073	38·0	73·0	
,, *megaptera*, Verrill,	A little further east.	2512	37·0	78·0	Two specimens.
,, ,, . .	A little further east still.	2574	37·0	79·0	,, ,,
,, sp.?, . . .	A little further north.	1054	38·0	74·0	
,, eggs of, . .	More than six localities in the same region.	428 to 1106	38·0 to 40·0	71·0 to 74·0	
Stauroteuthis syrtensis, Verrill,	30 miles east of Sable Island, Nova Scotia.	250	...	...	
	Off Martha's Vineyard.	523	39·0	68·0	
	Near same locality.	1346	...	...	
Opisthoteuthis agassizii, Verrill,	Off Grenada.	291	...	...	
	Off Martha's Vineyard.	1058	38·0	74·0	

From the above table it will be seen that (excluding the type form, concerning which no information has been published in this regard), not one of the species of *Cirroteuthis* has been found at a depth less than 600 fathoms, and, therefore, if we are justified in taking the depth to which the dredge or trawl descended as representing the depth from which the specimens were obtained, we must certainly regard them as deep-sea forms.

It is, however, well known to all who are familiar with the methods of deep-sea dredging that this cannot be at once assumed. Indeed, in one case, namely that of *Cirroteuthis pacifica*, the MS. Station Book kept on board the Challenger states that the specimen came from the surface, but it appears certain that this was merely an assumption based upon the supposed nature of the animal, and cannot be held as conclusive evidence in regard to the occurrence of these animals on the surface.

On the other hand, it is not a little noticeable that this family should have remained among the greatest of zoological rarities until deep-sea dredging was practised, and that then specimens should have been procured with comparative frequency. Negative evidence is proverbially unsatisfactory, but had they been surface organisms one would have expected that the voyages of the older zoologists would have shown us some trace of creatures which are too remarkable to have been passed over in silence had they been observed.

The fact that the animals in question should have been so long known from one locality in the Arctic regions is probably to be explained, as v. Willemoes-Suhm has hinted, by this being one more instance of a type found in the abyssal regions near the equator and in temperate regions of the globe, whilst it approaches near to the surface in the Polar regions (see p. 65). The probability that this hypothesis is correct is increased by a consideration of the temperatures of the various localities at which the specimens were found; a glance at the table shows that while the surface temperature in these various places varied as much as from 43° to 80° F., the bottom temperature was comparatively constant, ranging between 35°·6 and 41°·8 F.

Furthermore, eggs containing embryos undoubtedly belonging to this genus have been dredged by Professor Verrill in deep water, 428 to 1106 fathoms, and it would seem unreasonable to suppose that animals living at the surface should lay eggs and leave them to sink through so great a distance, during which time they would be exposed to great danger from the attacks of their enemies.

The two other genera discovered by Professor Verrill do not seem to be so certainly deep-sea animals as *Cirroteuthis*, for they have both been met with at depths of less than 300 fathoms, although they appear also to range to a depth of over 1000 fathoms.

In discussing this matter it must not be forgotten that there are animals with a very extensive bathymetrical range, *e.g.*, *Amphilepis norvegica*, among the Ophiuroidea, and *Bathyactis symmetrica* among the Corals, but these are exceptions, and from the reasons

detailed above, I am inclined to think that the Cirroteuthidæ belong to the deep-water rather than to the shallow seas.

As regards their habits we are quite in the dark. Reinhardt and Prosch in their treatise upon *Cirroteuthis mülleri* confessed their entire ignorance of this matter, and though they held out the hope that Dr. Rudolph would do something to enlighten the scientific world on this head, still the darkness remains as great as ever—whether the huge umbrella serves only for swimming, or whether it is also a kind of fishing net; what is the function of the cirri between the suckers? are they tactile like the long fringes of certain deep-sea fish? or do they serve to create a current sweeping particles of food to the mouth as already suggested (p. 56)? Even as regards the food of *Cirroteuthis* I can give no information, for all the specimens in the Challenger collection were either so fragmentary that it was impossible to examine their stomachs, or else these were empty. The intestine of *Cirroteuthis magna* contained a mass of pulpy material in which I found no recognisable fragments.

Another genus, which there is reason to regard as an inhabitant of the deep sea, is *Bathyteuthis*, the type specimen of which was dredged by the Challenger in the Southern Ocean, north-west of Kerguelen, from a depth of 1600 fathoms; and quite recently Professor Verrill has described, under the name *Benthoteuthis*, two other specimens from 600 and 1073 fathoms in the North Atlantic, obviously belonging to the same genus.[1] In the course of his description he calls attention to the embryonic characters of these animals, which indeed are too striking to escape notice, but these same characters may also point to the deep sea as the probable home of the species.

For the small fins seem but ill adapted for a pelagic life, and the minuteness of the suckers with which the arms and tentacles are provided seem little fitted for raptorial purposes, while the great size of the eyes is known to be a character of frequent occurrence in deep-sea animals, in addition to which the large buccal membrane may serve the purpose of collecting food from an oozy bottom.

A third genus which may perhaps be abyssal is *Mastigoteuthis*, Verrill, of which at present only one species is known, *Mastigoteuthis agassizii*, which has been dredged by the U.S.S. "Blake" and by the Fish Commission in depths varying from 647 to 2516 fathoms, while the Challenger brought home a single tentacle which adhered to the dredge-rope at Station 2 in the eastern part of the North Atlantic, where the depth was 1945 fathoms.

It will be seen that this species presents a great contrast to the last mentioned in the fin, which is exceedingly large, quite as large as in any of the pelagic forms; this would seem to indicate that although the animal may dwell in the deep sea, it by no means leads a sedentary existence; the two genera resemble each other, however, in the form of the tentacles, which are long, cylindrical and taper to points at the extremities instead of

[1] *Trans. Connect. Acad.*, vol. vi. pp. 401–403, 1885.

expanding to form clubs, and are armed with very minute suckers; I have not observed anything like a specialised tactile organ in either of these tentacles, or I should be disposed to suggest an analogy between them and the long streaming fringes found in certain deep-sea fish. The fact remains, however, that this form of tentacle is the only structural character which I have observed to be common to any two deep-sea Cephalopods. The stomach of one of Professor Verrill's specimens contained fragments of Crustacea, but we have no other information regarding its habits and mode of life.

It must be admitted that the evidence that this form came from the deep sea is by no means conclusive, but it is very suggestive that no individuals should have been taken in a surface net, while they seem to be not very uncommonly brought up by the deep-sea trawl.

Five species of *Octopus* (see p. 229), have been brought up from depths of over 500 fathoms, a particularly interesting fact since we are accustomed to consider these animals as being characteristic of shallow waters. It seems unlikely, however, that they live at the surface, for from what we know of the habits of this genus as observed in aquaria, they seem rather to frequent the bottom, hiding in crevices of the rocks, and clinging to them by their suckers, swimming only as a means of passing from one hiding place to another; the same remark applies also to the three species of *Eledone* (*Eledone verrucosa*, *Eledone rotunda* and *Eledone brevis*), which also appear in the lists of deep-water forms.

Eledonella has only been twice obtained and on both occasions by a dredge that had been down to the abyssal regions (1100 and 2949 fathoms), but its semitransparent consistency, resembling that of *Cranchia* and *Taonius*, is suggestive of its being a pelagic organism.

Alloposus mollis furnishes another problem for future investigation, both as regards its habits and its systematic position. All the specimens obtained in a perfect state have been brought up from considerable depths, and the tissues have a soft gelatinous character, recalling *Cirroteuthis;* perhaps this may be in some way correlated with deep-sea life; Günther has pointed out that abyssal fish when brought up to the surface present a marked flaccidity of their tissues.

As regards the single specimen which forms the type of the new genus *Promachoteuthis*, I feel quite unable to give any opinion as to its habits. It was brought up by the deep-sea trawl from a depth of 1875 fathoms, off the coast of Japan, but I have failed to find any sufficient evidence to show whether it came from the surface or the bottom.

The Taonoteuthids (*Calliteuthis*, *Histioteuthis*, &c.) form a group, whose bathymetrical distribution presents a still unsolved problem; perhaps the truth is that the species vary in this respect. Vérany records that his specimens of *Histioteuthis* were taken by the dredge; *Calliteuthis* has been taken by deep-sea dredges in depths varying from 345 to 2369 fathoms; the only specimen known of *Histiopsis* was brought up by a trawl which

had descended to 2025 fathoms. On the other hand, *Chiroteuthis veranyi* is distinctly stated by Vérany to live "à fleur d'eau pendant les calmes des belles saisons, au milieu des médusaires,"[1] and the same author records that he also found his specimen of *Chiroteuthis bonplandi* on the surface, while Verrill's examples of *Chiroteuthis lacertosa* have been obtained by dredging, apparently from depths varying from 300 to 2900 fathoms.

In this, as in so many other respects, we must await new facts before any conclusions of value can be obtained; the great need of the present day as regards inquiry into bathymetrical distribution is a net which can be opened and closed at any given depth.

[1] Céph. médit., p. 122.

SUMMARY.

The present Report opens with a synopsis of all the recent species of Cephalopods; no pains have been spared to ensure accuracy and completeness in this part of the work, and it is hoped that it will enable the memoir to serve to some extent as a monograph of the group, for though the space available precluded the possibility of adding diagnoses of genera and species, references have been given to the works where these may be obtained.

A list of the species contained in the Challenger collection occupies the next section of the Report, diagnoses of the new ones being given and such remarks as seemed necessary on those previously known. The Challenger collection contains 72 species, disposed in 30 genera, of which 32 species and 4 genera are described as new to science; it has only been found necessary, however, to create one new family (Amphitretidæ).

The "Porcupine," "Knight Errant," "Triton," and "Valorous" collections, which, as explained in the Introduction, are included in this memoir, contain 8 additional species, none of which are new, and 3 additional genera, making a total of 80 species and 33 genera recorded.

It is a matter for surprise that so few pelagic Cephalopods should have been captured on an expedition which spent so much time on the open ocean, and made such constant and systematic use of the townet. The explanation probably lies in the enormous activity of these animals, which is so great that they can only be captured when the vessel is moving rapidly, a condition which renders the use of the townet difficult if not impossible.

A most important means of obtaining them is by the examination of the stomachs of predaceous birds, fish and Cetacea, of whose food they form a large part; on the Challenger Expedition, for example, several specimens of *Ommastrephes oualaniensis* were taken from the stomach of a bird which alighted on the ship; and one of the most remarkable items in the collection, the large pen described on p. 178, was taken from the stomach of a shark. The value of the results which would accrue to science if whalers and those engaged in the capture of sea-fowl would preserve the contents of the stomachs in spirit, can hardly be exaggerated.

Some disappointment may be felt at there being no specimen, even fragmentary, of one of those giant squids (*Architeuthus*), which have been found, attaining sometimes a

length of sixty or seventy feet,[1] in all parts of the world, and which have, no doubt, contributed to the stories of the sea-serpent. The largest Cephalopod obtained by the Challenger was the type of *Cirroteuthis magna;* it measures more than a metre in length, and is interesting as being the largest individual of the genus which has yet been obtained.

The greatest accessions of new species have been to the already large genera *Octopus*, *Sepia*, and *Loligo*, but these are of less interest than the unique specimens which have been made types of new genera, each of which presents some character either entirely novel, or important as furnishing connecting links between previously known forms. The genus *Amphitretus*, for example, has two openings into the branchial cavity in place of one, a disposition found in no other Cephalopod; while *Histiopsis* is related closely to *Histioteuthis*, *Chiroteuthis*, and *Calliteuthis*.

The next section treats of Geographical Distribution, and an attempt has been made to supplement the work of the Challenger by a summary of all that has been recorded on this head. The species have been divided into "littoral" and "oceanic," the latter group including both "pelagic" and "abyssal." Lists of each of these are given, but owing probably to the want of complete information, the same species sometimes appears under two categories; thus an *Ommastrephes*, typically pelagic, may be obtained near the coast among littoral forms. It is much to be wished that future collectors will carefully note the exact localities where and the conditions under which specimens are obtained, and thus help to unravel some of the problems which wait solution regarding the distribution of these animals.

In the concluding section, which treats of Bathymetrical Distribution, still greater difficulties have been encountered, because in the case of such active creatures it is obviously impossible to assume that they were captured by the dredge or trawl at the greatest depth reached. In the case of the single specimen of *Promachoteuthis*, for example, there seems no means of arriving at any conclusion as to the depth whence it was obtained.

Nevertheless, taking all collateral facts into consideration, evidence is adduced which seems to indicate that *Cirroteuthis* almost certainly, *Bathyteuthis* and *Mastigoteuthis* probably, and possibly even one or two species of *Octopus*, may be veritably abyssal Cephalopods, but apart from the single fact that *Bathyteuthis* and *Mastigoteuthis* both have slender filiform tentacles with minute suckers, no structural features have been discovered which will serve to diagnose a deep-sea form from a shallow-water one.

[1] Verrill, Ceph. N.E. Amer., part i.

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Note.—Synonyms are printed in *italics;* the more important pages are indicated by darker type.

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EXPLANATION OF PLATES.

The figures of the animals have been drawn upon the stone under my supervision by Messrs. J. Reekie and A. Pollock, to whom I am indebted for the pains they have taken to carry out my wishes. Most of the details of tentacles, suckers, &c., have been copied from my own drawings, made with the assistance of the camera. For drawings of some species I am indebted to Professor Steenstrup, as is indicated on the plates where they are figured.

PLATE I.

PLATE I.

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OCTOPUS BOSCII (Lesueur), var. PALLIDA, nov., . . 81

Fig. 1. Lateral view of the animal; the larger specimen somewhat reduced.

Fig. 2. Portion of the dorsal surface, to show the multifid papillæ; magnified about 2 diameters.

Fig. 3. A large cirrus from the back; magnified 2 diameters.

Fig. 4. The dorsal mandible; natural size.

Fig. 5. The ventral mandible; natural size.

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OCTOPUS BOSCII var. PALLIDA, nov

PLATE II.

PLATE II.

PAGE

Figs. 1–4. Octopus levis, n. sp., . . . 98

Fig. 1. Dorsal view of the largest specimen; natural size.

Fig. 2. Extremity of the hectocotylised arm; magnified 3 diameters.

Fig. 3. The ventral mandible; natural size.

Fig. 4. The dorsal mandible; natural size.

Fig. 5. Octopus bermudensis, n. sp., . . . 94

Fig. 5. Dorsal view of the specimen; natural size.

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1-4, OCTOPUS LEVIS, n sp. 5, OCTOPUS BERMUDENSIS, n. sp.

PLATE III.

PLATE III.

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Fig. 1. Octopus levis, n. sp., . . . 98

Fig. 1. Inner side of umbrella, showing the circumoral lip and the hectocotylised arm; natural size.

Fig. 2. Octopus boscii (Lesueur), var. pallida, nov., . . 81

Fig. 2. View of the inner surface of the umbrella, showing the circumoral lip and the supernumerary sucker.

Figs. 4, 5. Octopus australis, n. sp., ... 88

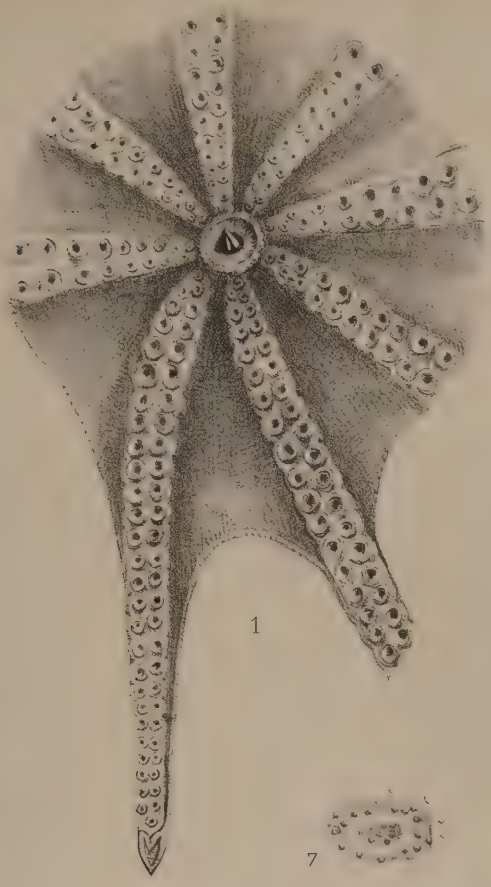
Fig. 4. Dorsal view of the larger specimen; natural size.

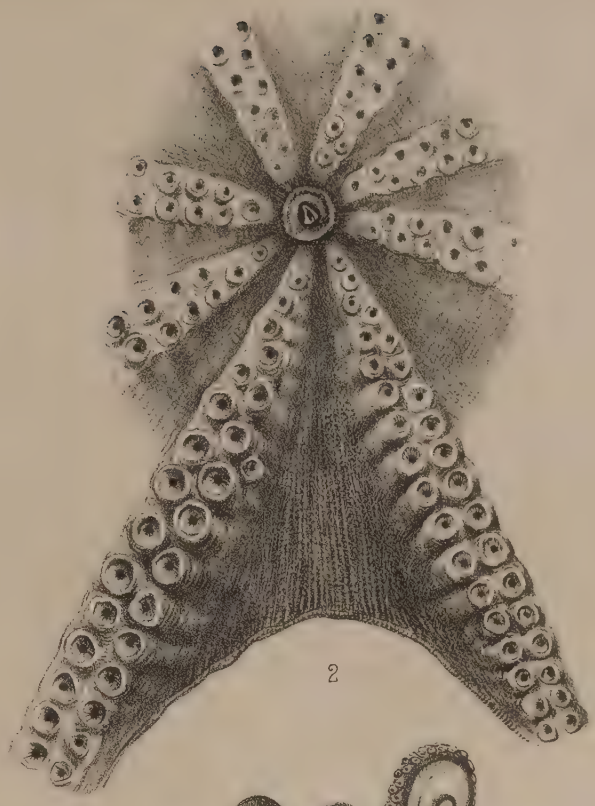
Fig. 5. Ventral aspect, showing the raised ridges along either side of the mantle.

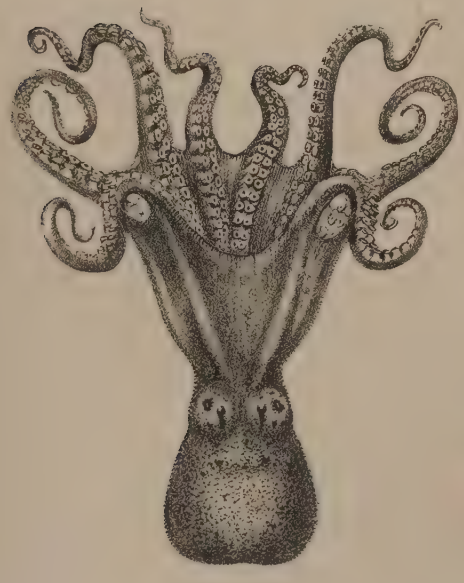
Figs. 6, 7. Octopus areolatus, de Haan, . . 86

Fig. 6. Lateral view of the Challenger specimen; natural size.

Fig. 7. The "ocellus" or eye-like spot, and some of the cutaneous warts, drawn from a specimen in the Copenhagen Museum; natural size.







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1, OCTOPUS LEVIS, n. sp. 2, OCTOPUS BOSCII, var. PALLIDA nov

4, 5, OCTOPUS AUSTRALIS, n. sp. 6, 7, OCTOPUS AREOLATUS, de Haan.

PLATE IV.

PLATE IV.

PAGE

OCTOPUS VERRUCOSUS, n. sp., ... 79

Fig. 1. Dorsal view of the animal; somewhat reduced.

Fig. 2. One of the suckers; natural size.

Fig. 3. Portion of a sucker, showing its radial grooves and rugose surface.

Fig. 4. The ventral mandible; natural size.

Fig. 5. The dorsal mandible; natural size.

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OCTOPUS VERRUCOSUS, n.sp.

PLATE V.

PLATE V.

PAGE

OCTOPUS PUNCTATUS, Gabb.,[1] 100

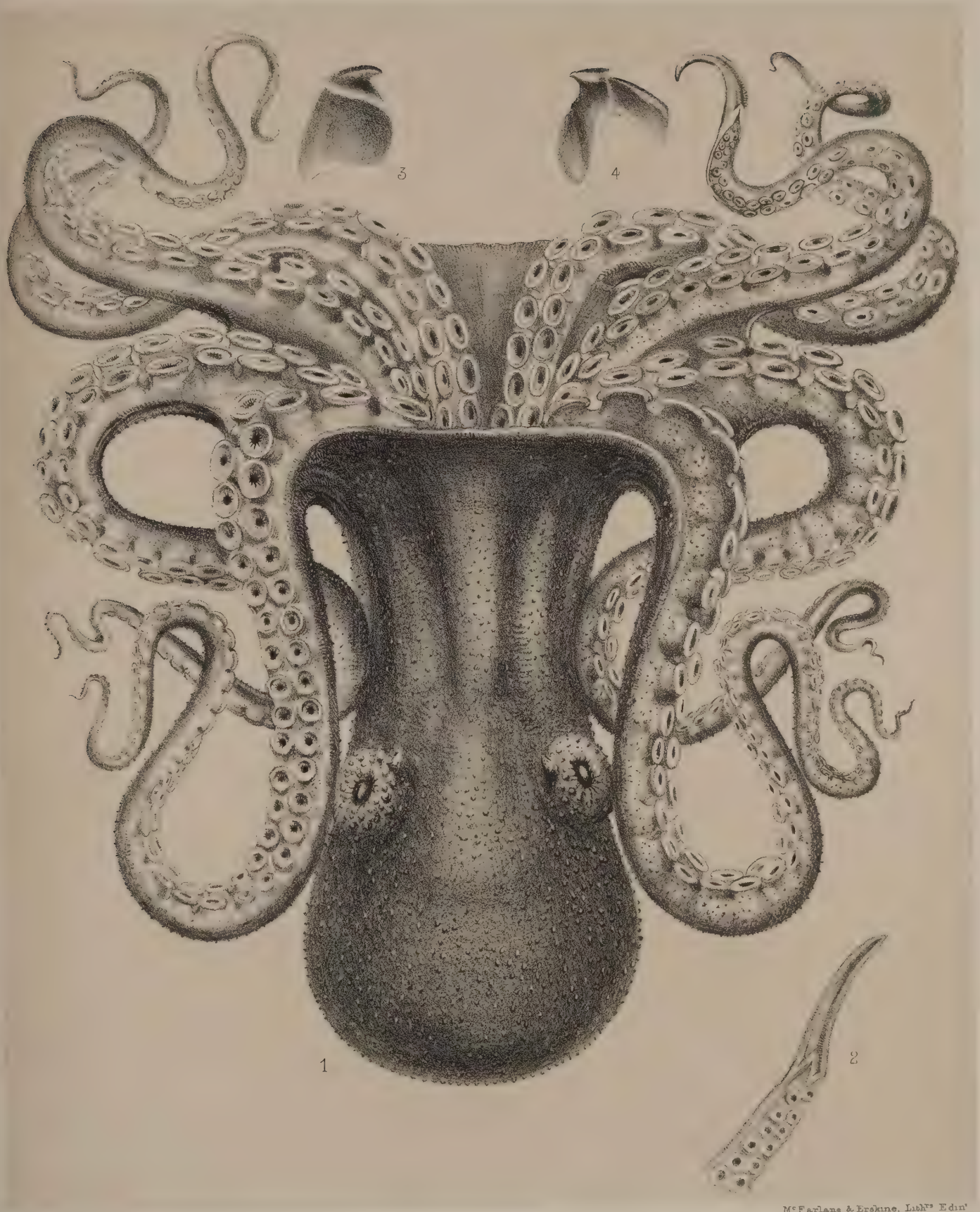
Fig. 1. Dorsal view of the animal; somewhat reduced.

Fig. 2. The extremity of the hectocotylised arm; natural size.

Fig. 3. The dorsal mandible; natural size.

Fig. 4. The ventral mandible; natural size.

[1] The name has been changed since the plate was printed off.



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OCTOPUS HONGKONGENSIS, Stp.

PLATE VI.

PLATE VI.

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OCTOPUS MARMORATUS, n. sp., ... 85

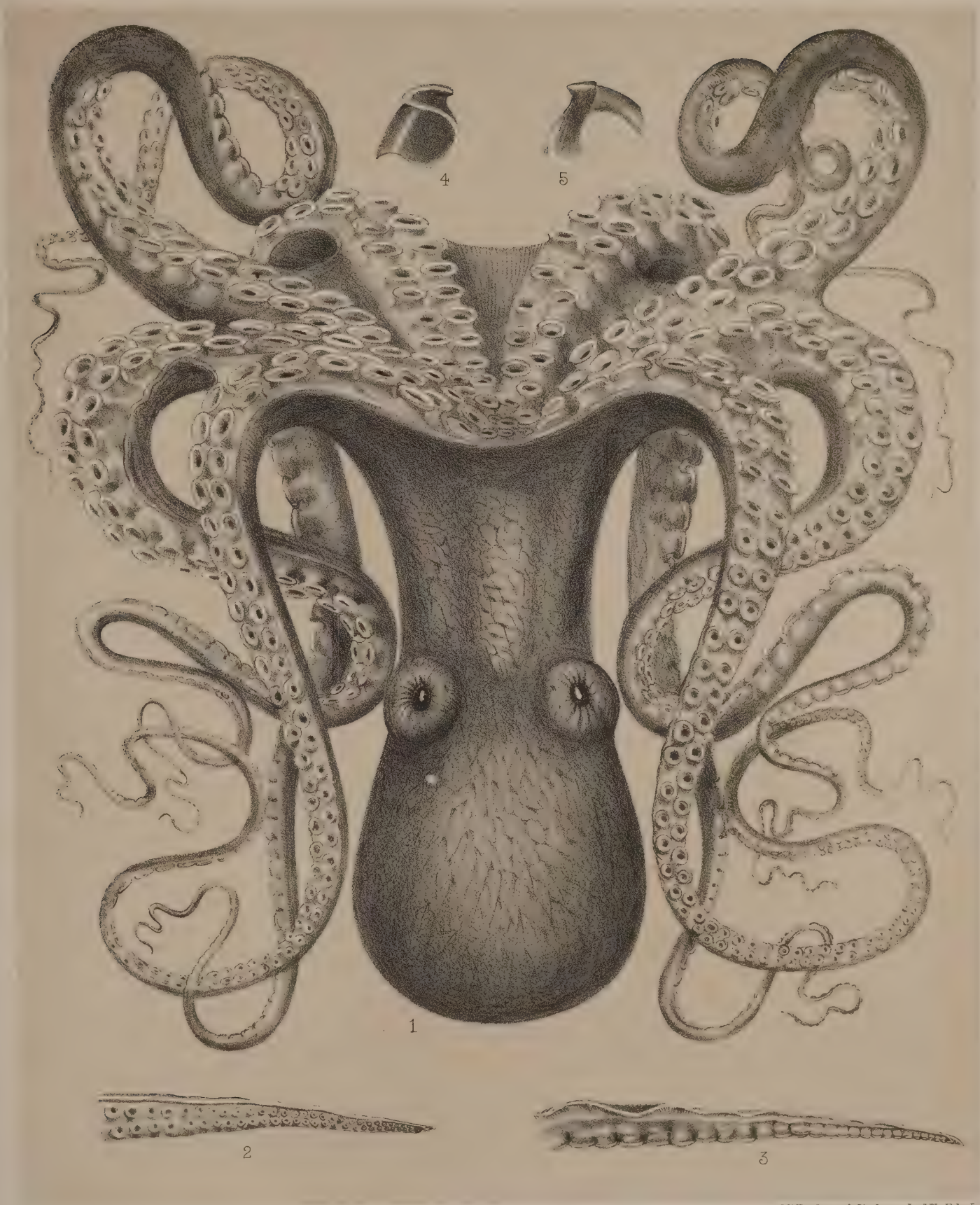
Fig. 1. Dorsal view of one of the female specimens; slightly reduced.

Fig. 2. Inner aspect of the extremity of the hectocotylised arm; natural size.

Fig. 3. Ventral aspect of the same arm; natural size.

Fig. 4. Dorsal mandible; natural size.

Fig. 5. Ventral mandible; natural size.



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OCTOPUS MARMORATUS, n. sp.

PLATE VII.

PLATE VII.

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Figs. 1–4. Octopus januarii, Steenstrup, . . 97

Fig. 1. Lateral view of the larger specimen; natural size.

Fig. 2. Extremity of the hectocotylised arm; somewhat enlarged.

Fig. 3. The dorsal mandible; natural size.

Fig. 4. The ventral mandible; natural size.

Fig. 5. Octopus duplex, n. sp., . . . 90

Fig. 5. Dorsal view of the specimen; natural size.

Figs. 6–8. Octopus vitiensis, n. sp., . . . 84

Fig. 6. Dorsal view of the specimen; somewhat enlarged.

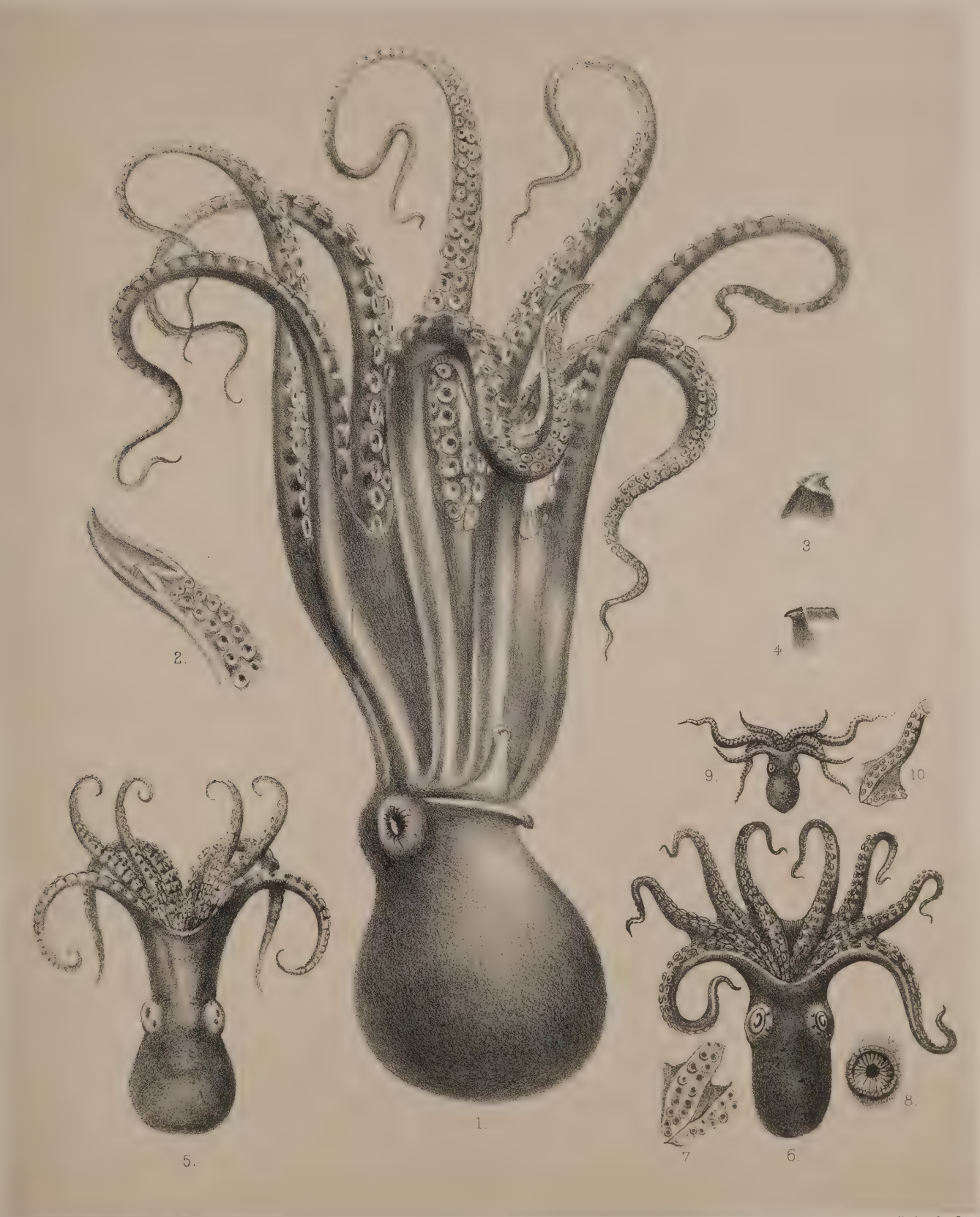
Fig. 7. Adoral portion of two of the arms.

Fig. 8. A sucker, to show its papillate margin and the rugose nature of the integument surrounding it; magnified 6 diameters.

Figs. 9, 10. Octopus bandensis, n. sp., . . . 96

Fig. 9. Dorsal view of the specimen, slightly enlarged.

Fig. 10. Adoral portion of two of the arms, somewhat enlarged; the four proximal suckers should have been represented in a single series.



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1-4, OCTOPUS JANUARII, Stp.
6-8, OCTOPUS VITIENSIS, n. sp.
5, OCTOPUS DUPLEX, n. sp.
9, 10, OCTOPUS BANDENSIS, n. sp

PLATE VIII.

PLATE VIII.

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Figs. 1, 2. Octopus tonganus, n. sp., . . . 83

Fig. 1. Lateral view of the animal; natural size.

Fig. 2. Extremity of the hectocotylised arm; magnified 4 diameters.

Fig. 3. Octopus pictus, Brock, var. fasciata, nov., . . 94

Fig. 3. Lateral view of the specimen; natural size.

Figs. 4–6. Eledone rotunda, n. sp., . . . 104

Fig. 4. Dorsal view of the animal; natural size.

Fig. 5. Dorsal mandible; natural size.

Fig. 6. Ventral mandible; natural size.

Fig. 7. Eledone brevis, n. sp., . . . 105

Fig. 7. Lateral view of the largest specimen; natural size. By an error of the draughtsman two of the cirri have been shown below the eye instead of above it.

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1, 2, OCTOPUS TONGANUS, n. sp.

3, OCTOPUS PICTUS, Brock, var. FASCIATA, nov

4–6, ELEDONE ROTUNDA, n. sp.

7, ELEDONE BREVIS, n. sp.

PLATE IX.

PLATE IX.

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Figs. 1, 2. JAPETELLA PRISMATICA, n. gen., n. sp., . . . 109

Fig. 1. Ventral aspect of the specimen; natural size.

Fig. 2. Dorsal aspect; natural size.

Figs. 3–6. ELEDONELLA DIAPHANA, n. sp., . . . 107

Fig. 3. Ventral aspect of the specimen; magnified 2 diameters.

Fig. 4. Ventral aspect, with the mantle divided a little to the left of the middle line, and reflected to show the median septum, the arrangement of the gills, &c.; magnified 2 diameters.

Fig. 5. View of the arms and umbrella from the front; magnified 1·5 diameters.

Fig. 6. Portion of an arm with five suckers, showing the prismatic form which they have assumed; enlarged.

Figs. 7 9. AMPHITRETUS PELAGICUS, n. gen., n. sp., . . 67

Fig. 7. Lateral view of the animal; magnified 2 diameters.

Fig. 8. Ventral view of one of the arms and of the mouth, the proximal suckers are somewhat too close; magnified nearly 2 diameters.

Fig. 9. Tip of one of the arms magnified about 4 diameters.

Figs. 10, 11. CIRROTEUTHIS sp., . . . 66

Fig. 10. Sucker taken from large dead *Cirroteuthis*, with portion of cutaneous membrane attached; slightly reduced.

Fig. 11. Section of a similar sucker; slightly enlarged.

Figs. 12, 13. CIRROTEUTHIS MEANGENSIS, Hoyle, . . 63

Fig. 12. Ventral view of the specimen; the postero-lateral angles should be a little more pronounced; magnified 4 diameters.

Fig. 13. Side view of the same specimen; magnified 4 diameters.

M'Farlane & Erskine, Lith^rs Edin^r

1, 2, JAPETELLA PRISMATICA, n. gen., n. sp 3–6, ELEDONELLA DIAPHANA, n. sp

7–9, AMPHITRETUS PELAGICUS, n. gen., n. sp. 10, 11, CIRROTEUTHIS, sp.?

12, 13, CIRROTEUTHIS, sp., juv.

PLATE X.

PLATE X.

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CIRROTEUTHIS PACIFICA, n. sp., . . . 61

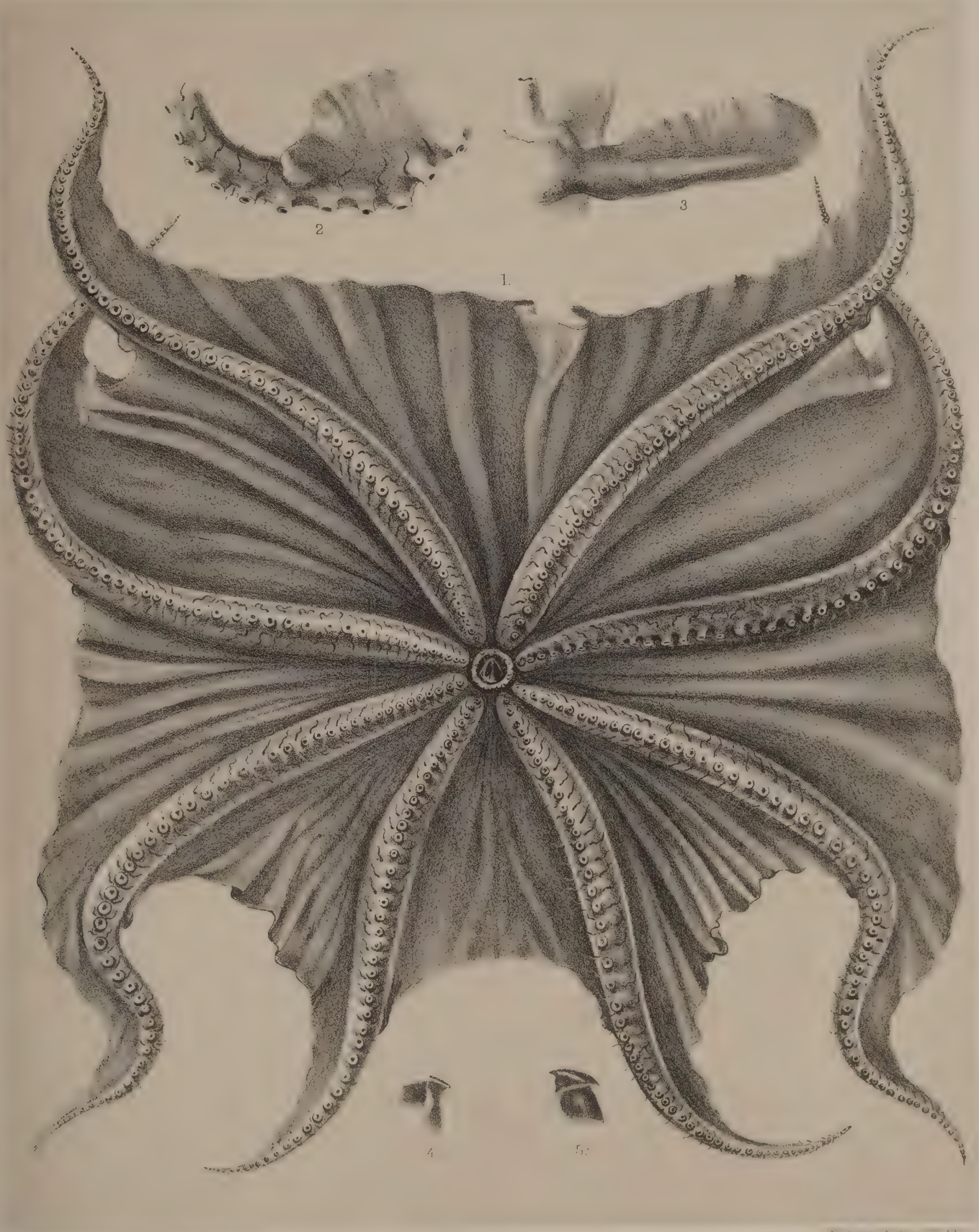
Fig. 1. View of the anterior surface of the umbrella with the arms and mouth; natural size.

Fig. 2. Portion of the ventral aspect of an arm, showing the attachment of the membrane and the nodule; natural size.

Fig. 3. Portion of the ventral aspect of the body, showing the siphon and fin; natural size.

Fig. 4. The ventral mandible; natural size.

Fig. 5. The dorsal mandible; natural size.



CIRROTEUTHIS PACIFICA, n. sp.

PLATE XI.

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Figs. 1, 2. CIRROTEUTHIS MEANGENSIS, n. sp., . . . 63

Fig. 1. Front view of right dorsal arm, showing the attachment of the web to it, and the nodule on its ventral aspect; natural size.

Fig. 2. View of the ventral side of the distal half of the same arm, showing the cirri continued to the extremity of the arm, and the nodule, with the margin of the web passing over it; magnified about 2 diameters.

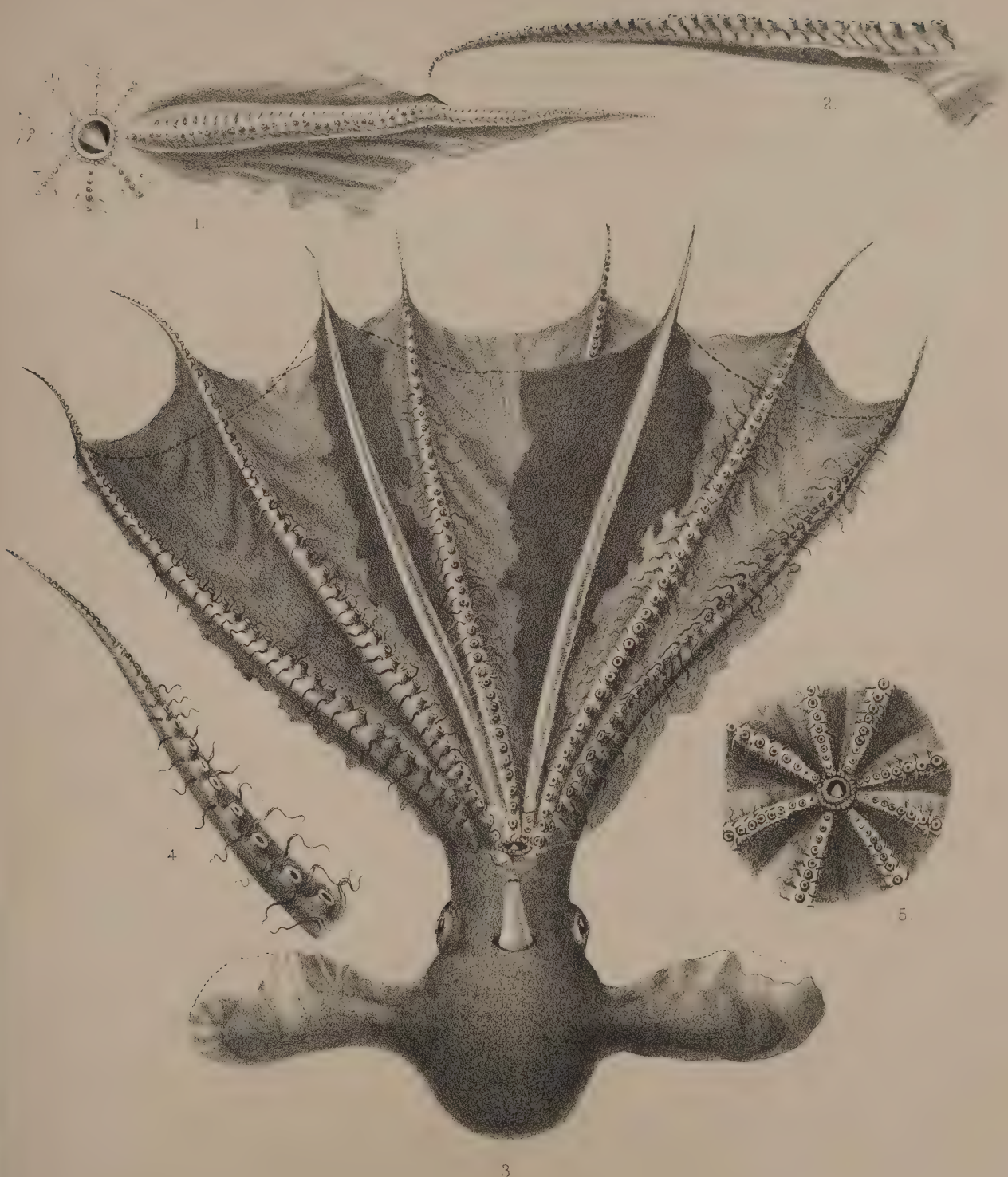
Figs. 3–5. CIRROTEUTHIS MAGNA,[1] n. sp., . . 60

Fig. 3. Ventral view of the animal; the greater part of the ventral side of the umbrella has been removed, and also the proximal portions of the two ventral arms. The distal margin of the membrane has been erroneously restored under the impression that the specimen was to be referred to the genus *Stauroteuthis* (see p. 61); natural size.

Fig. 4. Distal portion of an arm, showing the suckers and cirri; enlarged about 3 diameters.

Fig. 5. Central portion of umbrella and mouth, showing the proximal suckers and cirri; natural size.

[1] The name has been changed since the plate was printed off.



M'Farlane & Erskine, Lt.

1. 2. CIRROTEUTHIS MEANGENSIS, n sp. 3–5. STAUROTEUTHIS?

PLATE XII.

PLATE XII.

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CIRROTEUTHIS MAGNA, n. sp., . . . 56

Fig. 1. The animal viewed from the left side; the lateral arms of that side and the portions of the web attached to them have been removed so as to show the arrangement of the umbrella and the intermediate webs; one-sixth natural size.

Fig. 2. The tip of an arm, seen from the dorsal aspect; natural size.

Fig. 3. Portion of the ventral aspect of the right dorsal arm (the base being towards the right), showing the expansion of the margin of the web where it is fixed to the arm, and its attachment to the membrane which passes backwards from the arm, forming the intermediate web; natural size.

Fig. 4. Portion of the middle of an arm, showing some of the longest cirri; natural size.

Fig. 5. The mouth with the proximal suckers and ventral mandible; natural size.

Fig. 6. The dorsal mandible; natural size.

Fig. 7. The ventral mandible; natural size.

CIRROTEUTHIS MAGNA.

PLATE XIII.

PLATE XIII.

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Figs 1–4. CIRROTEUTHIS MAGNA, n. sp., . . . 56

Fig. 1. The dorsal cartilage, seen from the posterior aspect; natural size.

Fig. 2. The same cartilage, seen from above, showing the thin margins bending inwards over the dorsal surface so as to enclose a narrow space; natural size.

Fig. 3. Dorsal view of the cartilage of the specimen figured in Pl. XI. fig. 3; natural size.

Fig. 4. Posterior aspect of the same cartilage; natural size.

Figs. 5, 6. CIRROTEUTHIS MEANGENSIS, n. sp., . . . 63

Fig. 5. Posterior aspect of the cartilage of the specimen shown in Pl. XI. figs. 1, 2; natural size.

Fig. 6. Dorsal view of the same cartilage; natural size.

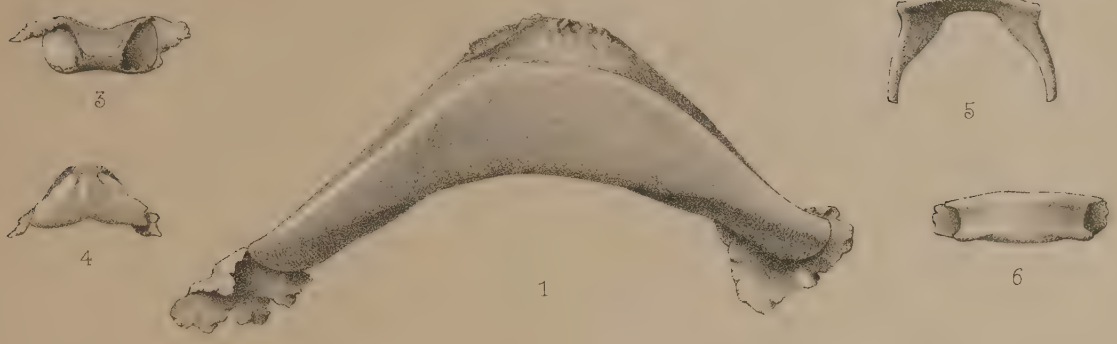
Fig. 7. TREMOCTOPUS QUOYANUS, d'Orb., . . . 70

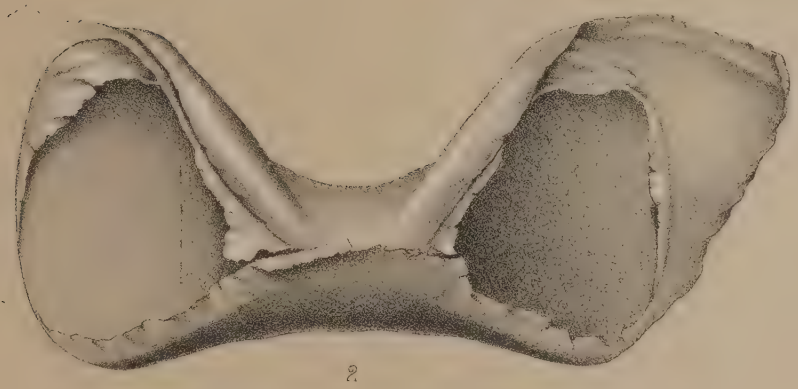
Fig 7. View of the head and arms, showing about five suckers of the hectocotylised arm protruding from its sac; magnified 3 diameters.

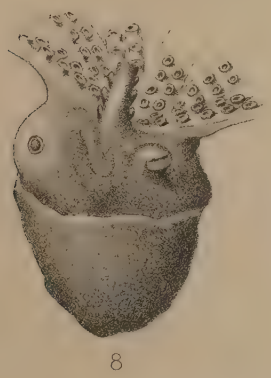
Figs. 8, 9. TREMOCTOPSIS GRACILIS (?), Eydoux et Souleyet, . 71

Fig. 8. The animal seen from the right ventro-lateral aspect, showing the hectocotylised arm coiled up beneath the integuments; magnified about 3 diameters.

Fig. 9. The hectocotylised arm removed from the sac; magnified 20 diameters. *a*, the swelling which afterwards forms the cyst near the extremity.







A. Pollock. delt. M^cFarlane & Erskine, Lith^rs Edin^r

1–4. CIRROTEUTHIS MAGNA, n. sp. 5, 6. CIRROTEUTHIS MEANGENSIS, n. sp.

7. TREMOCTOPUS QUOYANUS, (d'Orb.) 8, 9. TREMOCTOPUS GRACILIS (?) (E. et S.)

PLATE XIV.

PLATE XIV.

PAGE

Figs. 1–9. INIOTEUTHIS MORSEI, Verrill,[1] . . 112

Fig. 1. Dorsal view of a specimen; natural size.

Fig. 2. Lateral view of a sucker from one of the sessile arms; magnified 20 diameters.

Fig. 3. Front view of the same sucker; magnified 20 diameters.

Fig. 4. View of the right tentacular club; magnified 2 diameters.

Fig. 5. The right tentacular club of another specimen, seen from the outer aspect, to show the row of chromatophores upon it; magnified 2 diameters.

Fig. 6. An urceolate tentacular sucker, magnified 250 diameters.

Fig. 7. The distal extremity of a similar sucker; magnified 250 diameters.

Fig. 8. A similar sucker in optical section; magnified 250 diameters.

Fig. 9. Inner surface of the right ventral arm, to show the arrangement of the proximal suckers in two series; natural size.

Figs. 10–14. PROMACHOTEUTHIS MEGAPTERA, n. gen., n. sp., . 120

Fig. 10. Side view of the head, arms, and siphon, with the almond-shaped pit for articulation with the mantle; magnified 3 diameters.

Fig. 11. Ventral aspect of the head and siphon; magnified 3 diameters.

Fig. 12. Portion of an arm, showing the arrangement of the suckers; magnified 7 diameters.

Fig. 13. Circumoral region, showing the thick papillate lip and the bases of the arms and tentacles; magnified 2 diameters.

Fig. 14. A sucker from one of the arms; magnified 30 diameters.

[1] The name has been changed since the plate was printed off.

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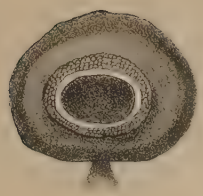

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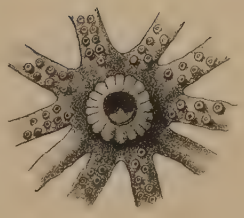

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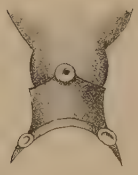

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1–9. SEPIOLA BURSA (?), Pfff. 10–14, PROMACHOTEUTHIS MEGAPTERA, n. gen. n. sp.

PLATE XV.

PLATE XV.

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Figs. 1–9. Rossia oweni, Ball, ... 114

Fig. 1. Dorsal view of a female specimen; natural size.

Fig. 2. The left dorsal arm of a male, showing the form of hectocotylisation; magnified 2 diameters.

Fig. 3. A large sucker from one of the lateral arms of the male, seen from the side; magnified 7 diameters.

Fig. 4. Front view of the same sucker; magnified 7 diameters.

Fig. 5. Second right arm of the male; natural size.

Fig. 6. Left tentacular club of the female specimen shown in fig. 1; very slightly enlarged.

Fig. 7. A large tentacular sucker; magnified 20 diameters.

Fig. 8. Profile view of the two rings of conical papillæ which surround the horny ring of a tentacular sucker; magnified 200 diameters.

Fig. 9. A portion of the horny ring of a similar sucker, with the papillary area surrounding it; magnified 200 diameters.

Figs 10–18. Rossia patagonica, E. A. Smith, . . . 119

Fig. 10. Third left arm of a male specimen; magnified 2 diameters.

Fig. 11. Second left arm of the same specimen; magnified 2 diameters.

Fig. 12. Inner aspect of the third left arm of another specimen; magnified 2 diameters.

Fig. 13. The outer aspect of the left dorsal arm of the male, showing the form of hectocotylisation; magnified 2 diameters.

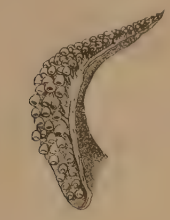
Fig. 14. Lateral view of an enlarged sucker from one of the lateral arms of the male; magnified 8 diameters.

Fig. 15. The left tentacular club; magnified about 5 diameters.

Fig. 16. A sucker from the tentacular club; magnified 40 diameters.

Fig. 17. Part of the horny ring of a tentacular sucker, with two teeth and the adjacent papillary area; magnified 200 diameters.

Fig. 18. Part of the horny ring of a sucker from one of the sessile arms; with the adjacent papillary area; magnified 200 diameters.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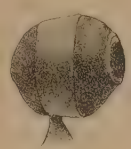
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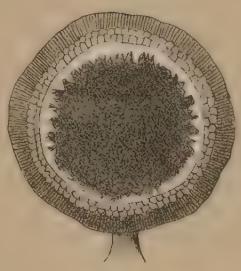
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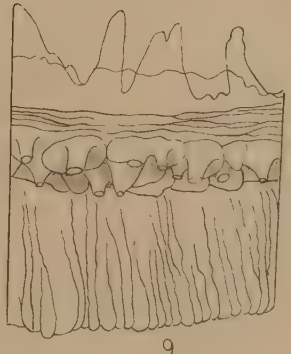
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McFarlane & Erskine Lith^rs Edin^r

1–9. ROSSIA OWENI, Ball. 10–18. ROSSIA PATAGONICA, E. A. Smith

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Figs. 1–12. SEPIA SMITHI, n. sp., . . . 124

Fig. 1. Dorsal view of one of the larger specimens; natural size.

Fig. 2. Ventral view of the head and siphon; natural size.

Fig. 3. View of the median aspect of the left tentacular club; natural size.

Fig. 4. View of the lateral aspect of the other club, to show the swimming-web and both protective membranes; natural size.

Fig. 5. Ventro-lateral view of the left tentacular club, showing one of the protective membranes (on the left of the figure) and the swimming-web on the right; natural size. This and the two preceding figures were taken from a somewhat larger specimen, whose mantle measured 85 mm. in length.

Fig. 6. A sucker from one of the sessile arms; magnified about 20 diameters.

Fig. 7. A similar sucker; magnified 20 diameters.

Fig. 8. One of the tentacular suckers; highly magnified.

Fig. 9. One tooth of the horny ring and the adjacent papillary area; magnified 200 diameters.

Fig. 10. Ventral aspect of the shell; natural size.

Fig. 11. Lateral aspect of the shell; natural size.

Fig. 12. Dorsal aspect of the shell; natural size.

Figs. 13–23. SEPIA PAPUENSIS, n. sp., . . . 126

Fig. 13. Dorsal view of the larger specimen; natural size.

Fig. 14. View of the ventral surface of the head and siphon; natural size.

Fig. 15. Tentacular club; magnified 6 diameters.

Fig. 16. Dorsal mandible; natural size.

Fig. 17. Ventral mandible; natural size.

Fig. 18. A tentacular sucker; magnified 20 diameters.

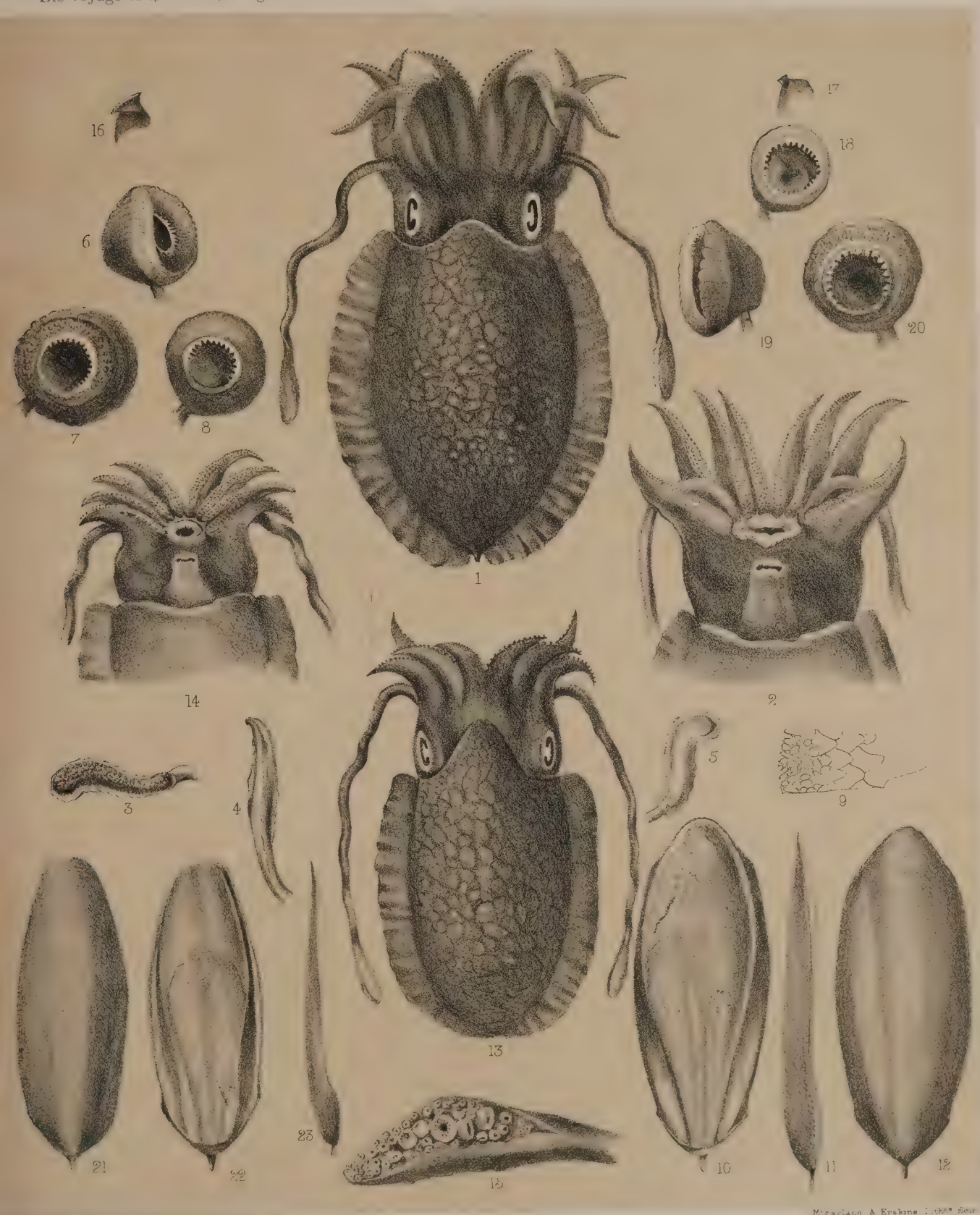
Fig. 19. A sucker of a sessile arm, seen from the side; magnified 20 diameters.

Fig. 20. Another sucker from a sessile arm, seen from the front; magnified 20 diameters.

Fig. 21. Dorsal view of the shell; natural size.

Fig. 22. Ventral view of the shell; natural size.

Fig. 23. Lateral view of the shell; natural size.



1–12, SEPIA SMITHI, n. sp 13–23, SEPIA PAPUENSIS, n. sp

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Figs. 1–5. SEPIA ESCULENTA, n. sp., . . . 129

Fig. 1. Dorsal view of the female specimen; natural size.

Fig. 2. The left ventral arm of the same specimen; magnified 1·5 diameter.

Fig. 3. Lateral aspect of the shell of the female specimen; natural size.

Fig. 4. The ventral mandible; natural size.

Fig. 5. The dorsal mandible; natural size.

Figs. 6–11. SEPIA KIENSIS, n. sp., . . . 141

Fig. 6. Ventral aspect of the specimen; natural size.

Fig. 7. Dorsal aspect of the specimen; natural size. The head was somewhat more retracted into the mantle than is indicated in the drawing.

Fig. 8. The left tentacular club; magnified 5 diameters.

Fig. 9. Ventral aspect of the shell; natural size.

Fig. 10. Dorsal aspect of the shell; natural size.

Fig. 11. Lateral aspect of the shell; natural size.

1–5. SEPIA ESCULENTA, n. sp. 6–11. SEPIA KIENSIS, n. sp.

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Figs. 1–6. SEPIA ESCULENTA, n. sp., . . . 129

Fig. 1. Ventral aspect of the shell of the female; natural size.

Fig. 2. Dorsal aspect of the shell of the female; natural size.

Fig. 3. Ventral aspect of the shell of the male; natural size.

Fig. 4. Part of the margin of a sucker from one of the sessile arms. The upper part of the drawing shows the smooth horny ring, while below it is the papillary area; highly magnified.

Fig. 5. Sucker from one of the sessile arms; magnified about 8 diameters.

Fig. 6. The parts surrounding the mouth of the male, showing the bases of the arms, the hectocotylisation of the left ventral one, the buccal membrane, and the inner and outer lips; natural size.

Figs. 7–14. SEPIA KOBIENSIS, n. sp., . . . 142

Fig. 7. Dorsal view of the specimen; natural size.

Fig. 8. Ventral view of the specimen; natural size. Showing the fins terminating on the ventral surface some distance from the extremity of the animal.

Fig. 9. Club of the left tentacle; magnified 7 diameters.

Fig. 10. A sucker from one of the sessile arms; magnified 20 diameters.

Fig. 11. Another view of a similar sucker, in which the distal depression is not marked; magnified 20 diameters.

Fig. 12. Lateral view of the shell; natural size.

Fig. 13. Dorsal view of the shell; natural size.

Fig. 14. Ventral view of the shell; natural size.

1–6. SEPIA ESCULENTA, n. sp.

7–14. SEPIA KOBIENSIS, n. sp.

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Figs. 1–13. SEPIA SULCATA, n. sp., ... 137

Fig. 1. Ventral aspect of the specimen; natural size.

Fig. 2. Dorsal aspect of the specimen; natural size.

Fig. 3. The left tentacular club; magnified 7 diameters.

Fig. 4. The hectocotylised arm; magnified 2 diameters.

Fig. 5. A transverse section of the same, to show the groove and the rounded fillet lying in it; magnified 3 diameters.

Fig. 6. A tentacular sucker; magnified 40 diameters.

Fig. 7. A sucker from one of the sessile arms; magnified 40 diameters.

Fig. 8. A portion of the papillary area; magnified 200 diameters.

Fig. 9. The ventral mandible; natural size.

Fig. 10. The dorsal mandible; natural size.

Fig. 11. Ventral aspect of the shell; natural size.

Fig. 12. Lateral aspect of the shell; natural size.

Fig. 13. Dorsal aspect of the shell; natural size.

Figs. 14–24. SEPIA ELLIPTICA, n. sp., ... 131

Fig. 14. Dorsal view of a specimen; natural size.

Fig. 15. Ventral view of a specimen; natural size.

Fig. 16. Inner aspect of the hectocotylised arm; magnified 2 diameters.

Fig. 17. A sucker from a sessile arm, with smooth horny ring; magnified 20 diameters.

Fig. 18. A portion of the papillary area, the upper margin is the horny ring; magnified 200 diameters.

Fig. 19. A somewhat compressed sucker from a sessile arm, showing slight toothing of the distal margin of the horny ring; magnified 20 diameters.

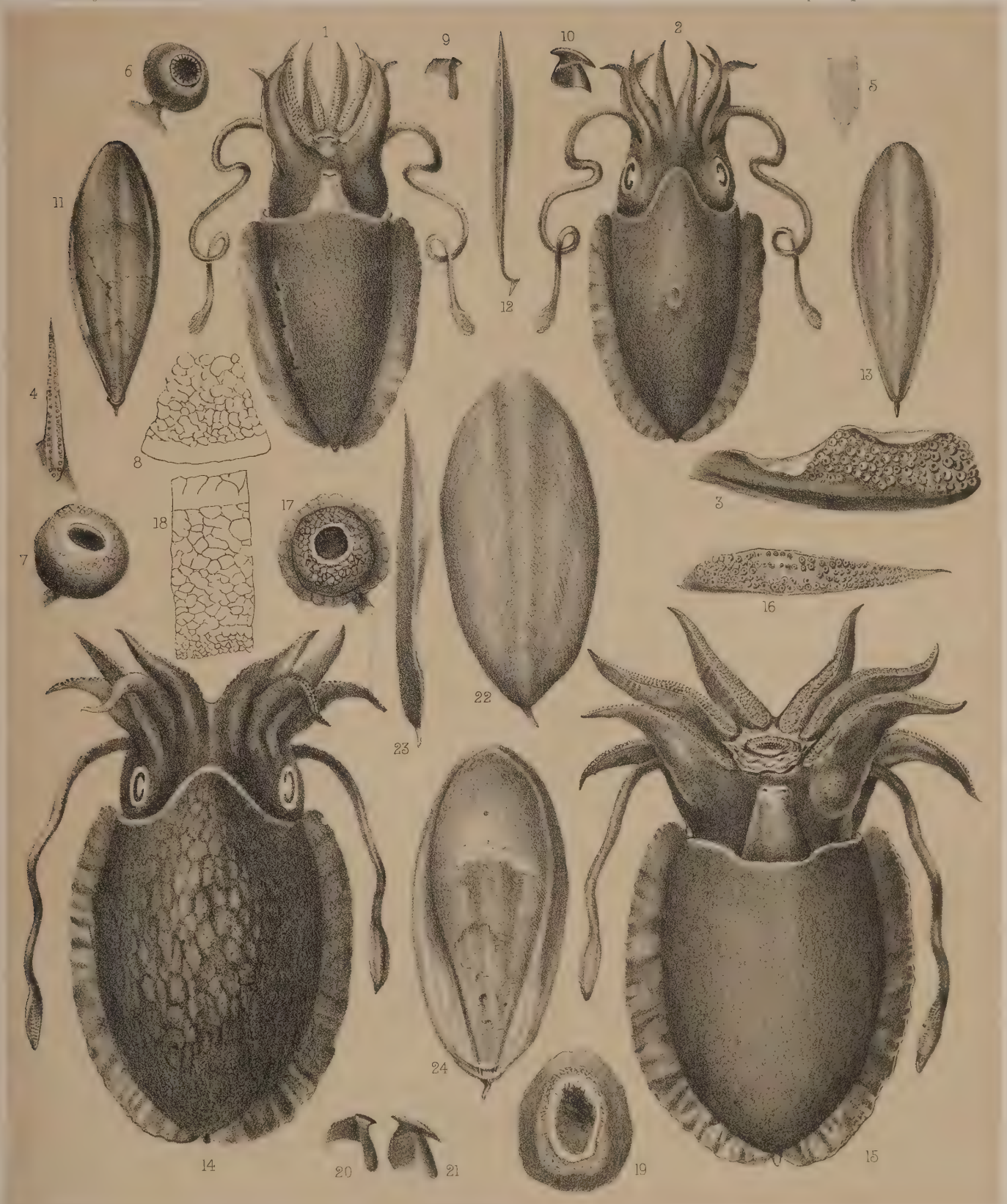
Fig. 20. Ventral mandible; natural size.

Fig. 21. Dorsal mandible; natural size.

Fig. 22. Dorsal aspect of the shell; natural size.

Fig. 23. Lateral aspect of the shell; natural size.

Fig. 24. Ventral aspect of the shell; natural size.



M'Farlane & Erskine, Lith.ª Edin.ª

1–3, SEPIA SULCATA, n. sp. 14–24, SEPIA ELLIPTICA, n. sp.

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SEPIA CULTRATA, Steenstrup, . . . 133

Fig. 1. Dorsal aspect of the specimen; natural size.

Fig. 2. Ventral aspect of the specimen; natural size.

Fig. 3. The circumoral region, showing the bases of the arms, the inner and outer lips, and the spermatic pad with a few spermatophores adhering to it; magnified 2 diameters.

Fig. 4. Inner aspect of one of the sessile arms; magnified 2 diameters.

Fig. 5. Right tentacular club; magnified 7 diameters.

Fig. 6. Sucker from one of the sessile arms; magnified about 15 diameters.

Fig. 7. The ventral mandible; natural size.

Fig. 8. The dorsal mandible; natural size.

Fig. 9. Dorsal aspect of the shell; natural size.

Fig. 10. Ventral aspect of the shell; natural size.

Fig. 11. Side view of the extremity of the shell, showing the knife-like ridge on the spine; natural size.

M'Farlane & Erskine Lith.t Edin.t

SEPIA CULTRATA. Stp

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Figs. 1–10. SEPIA (METASEPIA) PFEFFERI, n. sp., . . 145

Fig. 1. Dorsal view of the specimen; natural size.

Fig. 2. Ventral view of the anterior portion; natural size.

Fig. 3. Circumoral region, showing the lips, buccal membrane, spermatic pad with some spermatophores upon it, and the bases of the arms; magnified 2 diameters.

Fig. 4. Dorsal aspect of the shell; natural size.

Fig. 5. Ventral aspect of the shell; natural size.

Fig. 6. Inner aspect of one of the arms; natural size.

Fig. 7. The left tentacular club; magnified about 3 diameters.

Fig. 8. The ventral mandible; natural size.

Fig. 9. The dorsal mandible; natural size.

Fig. 10. A sucker from one of the sessile arms; magnified 15 diameters.

Figs. 11–19. SEPIA ANDREANOIDES, n. sp., . . 139

Fig. 11. Ventral view of a specimen, with the tentacles retracted; natural size.

Fig. 12. Dorsal view, with extended tentacles; natural size.

Fig. 13. The right tentacular club; magnified about 3 diameters.

Fig. 14. Dorsal aspect of the shell; natural size.

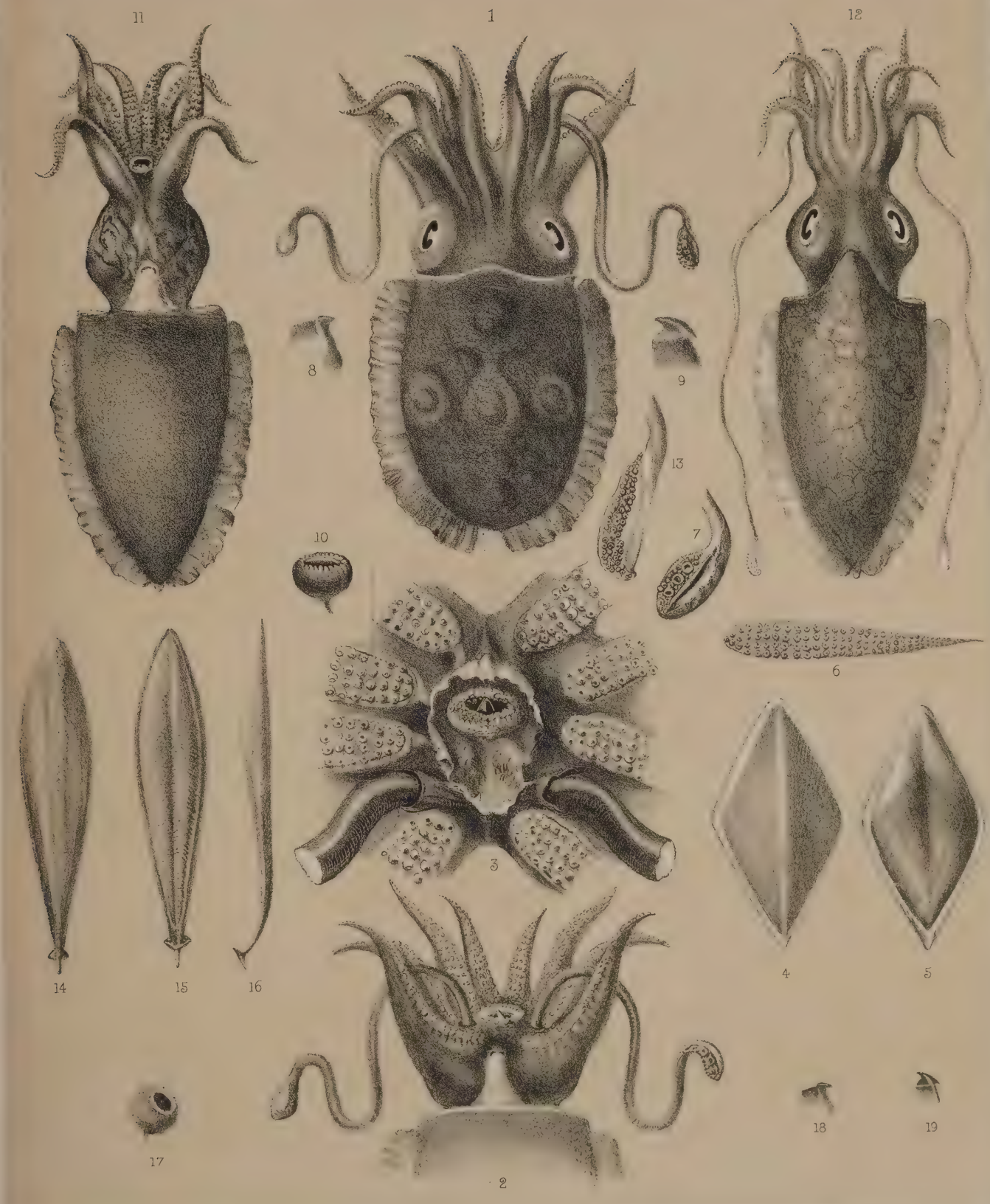
Fig. 15. Ventral aspect of the shell; natural size.

Fig. 16. Lateral aspect of the shell; natural size.

Fig. 17. A sucker from one of the sessile arms; magnified 12 diameters.

Fig. 18. Ventral mandible; natural size.

Fig. 19. Dorsal mandible; natural size.



1–10, SEPIA (METASEPIA) PFEFFERI, n. sp. 11–19, SEPIA ANDREANOIDES, n. sp

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Figs. 1–10. SEPIELLA MAINDRONI, de Rochebrune, . . 149

Fig. 1. Ventral aspect of the specimen; natural size.

Fig. 2. Side view of a sucker from one of the sessile arms; magnified 20 diameters.

Fig. 3. Front view of the same sucker; magnified 20 diameters.

Fig. 4. A tentacular sucker on its peduncle; magnified 20 diameters.

Fig. 5. Front view of a similar sucker; magnified 20 diameters.

Fig. 6. The distal half of the horny ring of a similar sucker, to show the denticulation; magnified 30 diameters.

Fig. 7. A portion of the papillary area from a similar sucker; magnified 200 diameters.

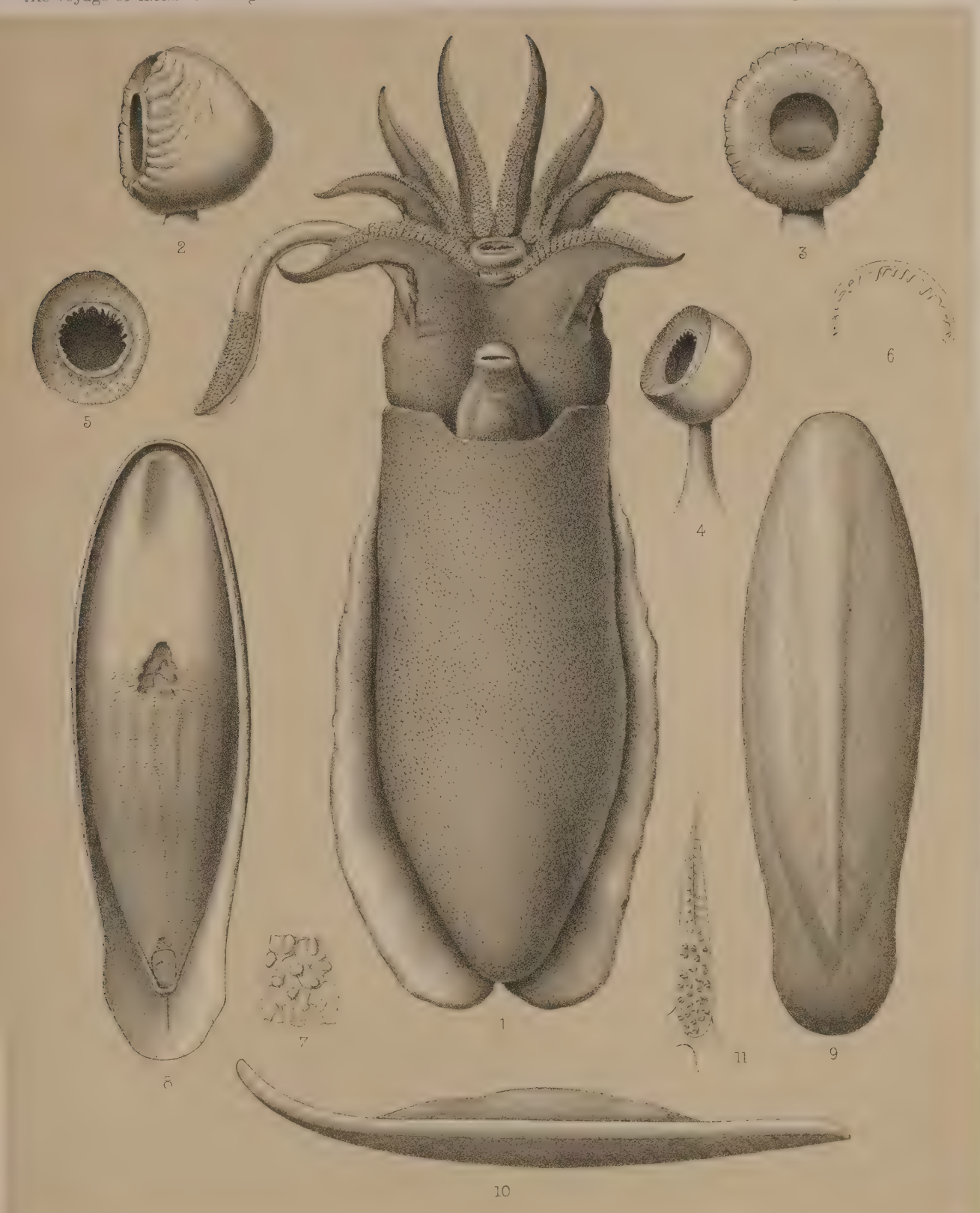
Fig. 8. Ventral aspect of the shell; natural size.

Fig. 9. Dorsal aspect of the shell; natural size.

Fig. 10. Lateral aspect of the shell; natural size.

Fig. 11. SEPIA ANDREANOIDES, n. sp., . . . 139

Fig. 11. The hectocotylised arm of the male specimen; magnified 2 diameters.



1–10. SEPIELLA MAINDRONI (?) Rochebr. 11. SEPIA ANDREANOIDES, n. sp.

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LOLIGO EDULIS, n. sp., ... 152

Fig. 1. Ventral aspect of the specimen; natural size.

Fig. 2. Dorsal aspect of the head; natural size.

Fig. 3. Lateral view of a sucker, from one of the sessile arms; magnified 11 diameters.

Fig. 4. Front view of a similar sucker; magnified 11 diameters.

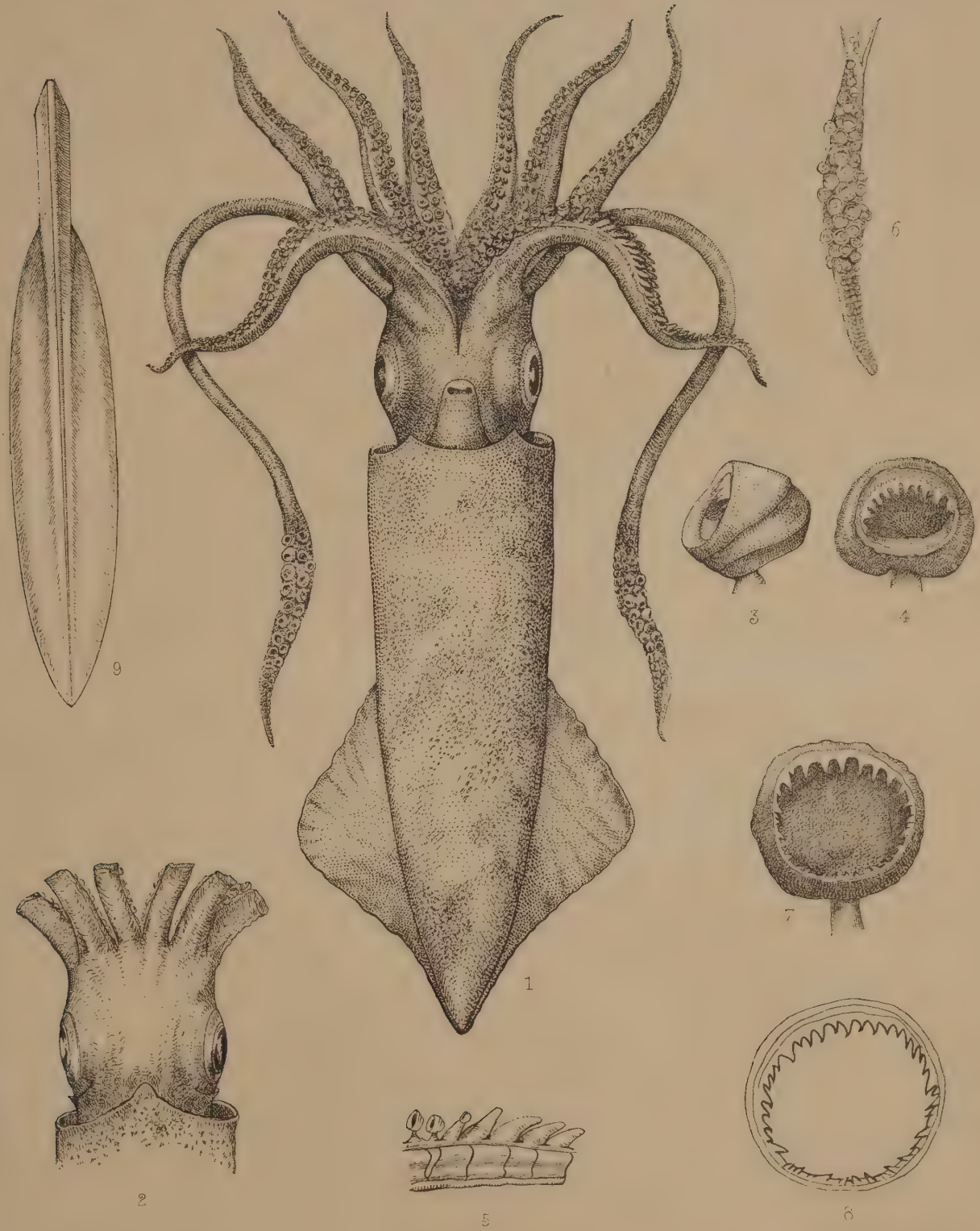
Fig. 5. Portion of the hectocotylised arm, showing the transition from the suckers to the conical papillæ, seen from the ventral side; magnified 3 diameters.

Fig. 6. The tentacular club; magnified 2 diameters.

Fig. 7. Lateral sucker, from the tentacular club; magnified 20 diameters.

Fig. 8. Horny ring, from one of the large tentacular suckers; magnified 20 diameters.

Fig. 9. Dorsal aspect of the gladius; natural size.



M.Farlane & Erskine Lith.t Edin.t

LOLIGO EDULIS, n. sp.

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Figs. 1–6. LOLIGO ELLIPSURA, n. sp., . . . 160

Fig. 1. The specimen, seen from the ventral aspect; natural size.

Fig. 2. The dorsal surface of the head; natural size.

Fig. 3. Part of the horny ring and papillary area, from a large tentacular sucker; magnified 450 diameters.

Fig. 4. Side view of a sucker, from one of the sessile arms; magnified 60 diameters.

Fig. 5. Front view of a similar sucker; magnified 60 diameters.

Fig. 6. A lateral tentacular sucker; magnified 100 diameters.

Figs. 7–15. LOLIGO JAPONICA, Steenstrup, . . 157

Fig. 7. The specimen, seen from the ventral aspect; natural size.

Fig. 8. Side view of a sucker, from one of the sessile arms; magnified 10 diameters.

Fig. 9. A terminal tentacular sucker; magnified 50 diameters.

Fig. 10. The hectocotylised arm of a specimen in the Copenhagen Museum; magnified 2 diameters. Drawn by Mr. Thornam.

a. A small portion, still more enlarged, to show the form of the papillæ.

Fig. 11. Inner aspect of the tentacular club; magnified 2 diameters.

Fig. 12. Lateral aspect of the tentacular club; magnified 2 diameters.

Fig. 13. A lateral tentacular sucker; magnified 20 diameters.

Fig. 14. A median tentacular sucker; magnified 10 diameters.

Fig. 15. The gladius; natural size.

1–6. LOLIGO ELLIPSURA, n. sp. 7–15. LOLIGO JAPONICA, Stp.

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Figs. 1–10. LOLIGO KOBIENSIS, n. sp., ... 154

Fig. 1. Ventral view of the animal; natural size.

Fig. 2. Side view of a sucker from one of the sessile arms; magnified 10 diameters.

Fig. 3. Front view of a similar sucker; magnified 10 diameters.

Fig. 4. The circumoral region, showing the ventral mandible, the lips, and the buccal membrane, with suckers upon its points and the spermatic pad in the ventral median line; there are no spermatophores on the pad, but a few may be seen on the left ventral arm (a).

Fig. 5. The tentacular club; slightly enlarged.

Fig. 6. Side view of a median tentacular sucker; magnified 7 diameters.

Fig. 7. Front view of a similar sucker; magnified 7 diameters.

Fig. 8. A terminal tentacular sucker; magnified 20 diameters.

Fig. 9. A lateral tentacular sucker; magnified 10 diameters.

Fig. 10. The gladius; natural size.

Figs. 11–15. LOLIGO ELLIPSURA, n. sp., ... 160

Fig. 11. The left tentacular club; magnified 7 diameters.

Fig. 12. Front view of a median tentacular sucker; magnified 40 diameters.

Fig. 13. Oblique view of a similar sucker; magnified 40 diameters.

Fig. 14. The horny ring of a similar sucker; magnified 200 diameters.

Fig. 15. The gladius; natural size.

1–10. LOLIGO KOBIENSIS, n. sp. 11–15. LOLIGO ELLIPSURA, n. sp.

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LOLIGO INDICA, Pfeffer, ... 156

Fig. 1. Ventral aspect of the largest specimen; natural size.

Fig. 2. Dorsal aspect of the head; natural size.

Fig. 3. Front view of a sucker, from one of the sessile arms; magnified 20 diameters.

Fig. 4. Side view of the same sucker; magnified 20 diameters.

Fig. 5. A median tentacular sucker; magnified 20 diameters.

Fig. 6. The right tentacular club; magnified 7 diameters.

Fig. 7. The horny ring of a median tentacular sucker; magnified 20 diameters.

Fig. 8. A terminal tentacular sucker; magnified 20 diameters.

Fig. 9. A lateral tentacular sucker; magnified 20 diameters.

Fig. 10. The gladius of a smaller specimen; natural size.

LOLIGO INDICA, Pfeffer

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LOLIGO GALATHEÆ, Steenstrup, . . 159

Fig. 1. Dorsal view of a male specimen; natural size.

Fig. 2. Suckers from one of the sessile arms of the same individual; enlarged.

Fig. 3. Side view of a sucker, from the proximal third of the third left arm; magnified 70 diameters.

Fig. 4. Front view of the same sucker; magnified 70 diameters.

Fig. 5. The hectocotylised arm of the individual shown in fig. 1; magnified 2 diameters.

Fig. 6. Two pairs of papillæ from about halfway up the arm; enlarged.

Fig. 7. A papilla with a very small sucker at its tip; enlarged.

Fig. 8. A papilla whose sucker has entirely disappeared; enlarged.

Fig. 9. A portion of the tentacular club; magnified 2 diameters.

Fig. 10. A median tentacular sucker; magnified 30 diameters.

Fig. 11. A lateral tentacular sucker; magnified 30 diameters.

Fig. 12. The gladius; natural size.

Figs. 1, 2, 5, 6, 7, 8, 9, 12 were drawn by Mr. Thornam from a specimen in the Copenhagen Museum; the remainder are from the immature Challenger specimens.

A. Pollock, lith.

M'Farlane & Erskine, Lith^rs Ed.

LOLIGO GALATHEÆ, Sp.

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Figs. 1–5. TODARODES PACIFICUS, Steenstrup, . . 168

Fig. 1. Dorsal aspect of a female specimen; two-thirds the natural size.

Fig. 2. The third right arm; magnified 1·5 diameter.

Fig. 3. Two suckers from about one-third up the same arm; magnified 4 diameters.

a. A portion of the horny ring still more enlarged.

Fig. 4. The left tentacular club; natural size.

Fig. 5. Two median tentacular suckers; magnified 2 diameters.

All the above figures were drawn by Mr. Thornam from a specimen in the Copenhagen Museum.

Figs. 6–12. TRACHELOTEUTHIS RIISEI, Steenstrup, . . 164

Fig. 6. Dorsal view of the specimen; natural size.

Fig. 7. Ventral aspect of the siphon; magnified 2 diameters.

Fig. 8. A sucker from one of the sessile arms; magnified 60 diameters.

Fig. 9. The tentacular club; magnified about 7 diameters.

Fig. 10. A large tentacular sucker; magnified 60 diameters.

Fig. 11. A terminal tentacular sucker; magnified 100 diameters.

Fig. 12. A small tentacular sucker; magnified 250 diameters.

Fig. 13. TAONIUS ELONGATUS, Steenstrup, . . 189

Fig. 13. Dorsal view of the type specimen; one-fourth the natural size. From a sketch by Mr. Thornam.

1–5, TODARODES PACIFICUS, Stp. 6–12, TRACHELOTEUTHIS RIISEI, Stp
13, TAONIUS ELONGATUS, Stp

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Figs. 1–7. BATHYTEUTHIS ABYSSICOLA, n. gen., n. sp., . . 168

Fig. 1. Dorsal view of the specimen; natural size.

Fig. 2. View of the ventral aspect of the siphon, to show the mantle-connective; somewhat enlarged.

Fig. 3. Anterior aspect of the arms and circumoral region; magnified 3 diameters.

Fig. 4. A sucker from one of the sessile arms; magnified 200 diameters.

Fig. 5. The extremity of the left tentacle; magnified 10 diameters.

Fig. 6. A tentacular sucker; magnified 200 diameters.

Fig. 7. The gladius; natural size. The dotted line indicates the presumed outline of the damaged posterior extremity.

Figs. 8–10. MASTIGOTEUTHIS AGASSIZII, Verrill, . . 170

Fig. 8. Front view of a tentacular sucker; magnified 60 diameters.

Fig. 9. Side view of a similar sucker; magnified 30 diameters.

Fig. 10. Part of a front view of a similar sucker, to show the form of the horny ring and the papillary area.

Fig. 11. ENOPLOTEUTHIS MARGARITIFERA, Rüppell, . . 171

Fig. 11. The left tentacular club; magnified 25 diameters.

1–7, BATHYTEUTHIS ABYSSICOLA, n. gen., [illegible] 8–10, MASTIGOTEUTHIS AGASSIZII, V.
11, ENOPLOTEUTHIS MARGARITIFERA, Rüpp

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Figs. 1–8. TELEOTEUTHIS CARIBBÆA (Lesueur), . . 172

Fig. 1. The tentacular club; magnified.

Fig. 2. A large marginal sucker.

Fig. 3. A terminal sucker; very highly magnified.

Fig. 4. A median sucker from the second transverse row, showing the incipient hook.

Fig. 5. A similar sucker, but slightly further up the club, showing a longer hook.

Fig. 6. Front view of a median hook.

Fig. 7. Side view of a similar hook.

Fig. 8. A similar hook, viewed from above.

Figs. 9–15. HISTIOPSIS ATLANTICA, n. gen., n. sp., . . 180

Fig. 9. Ventral aspect of the specimen; natural size.

Fig. 10. Dorsal aspect of the specimen; natural size.

Fig. 11. Circumoral region, showing the buccal membrane and the bases of the arms and tentacles; natural size.

Fig. 12. Front view of the larger suckers, from the distal half of the arms.

Fig. 13. Side view of the same sucker.

Fig. 14. One of the smaller suckers, from the proximal part of the arm.

Fig. 15. The gladius; natural size.

A. Pollock, del.

M^cFarlane & Erskine, Lith^rs Edin^r

1–8, TELEOTEUTHIS CARIBBÆA (Lesr.) 9–15, HISTIOPSIS ATLANTICA, n.gen n. sp

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Figs. 1–5. CHIROTEUTHIS (?) sp., . . . 178

Fig. 1. Side view of a portion of the pen; natural size.

Fig. 2. Dorsal view of a portion, anterior to the last; natural size.

Fig. 3. Section through the anterior part of fig. 1; natural size.

Fig. 4. Section through another portion situated some distance behind that shown in fig. 1; natural size.

Fig. 4*a*. Section through the anterior part of fig. 2; natural size.

Fig. 5. Section through the extremity of the smallest portion in the collection; natural size.

Figs. 6–10. TRACHELOTEUTHIS (?) sp., . . 166

Fig. 6. Dorso-lateral view of a specimen, which had been mounted as a microscopic object, and was much compressed; magnified 4 diameters.

Fig. 7. Similar view of another specimen, which had been preserved in alcohol; magnified 4 diameters.

Fig. 8. Dorsal aspect of the head, showing the prominent lip between the arms; magnified 7 diameters.

Fig. 9. Ventral view of the siphon, showing the pits for articulation with the mantle; magnified 20 diameters.

Fig. 10. The posterior extremity, showing the form of the pen and the fins; magnified 4 diameters.

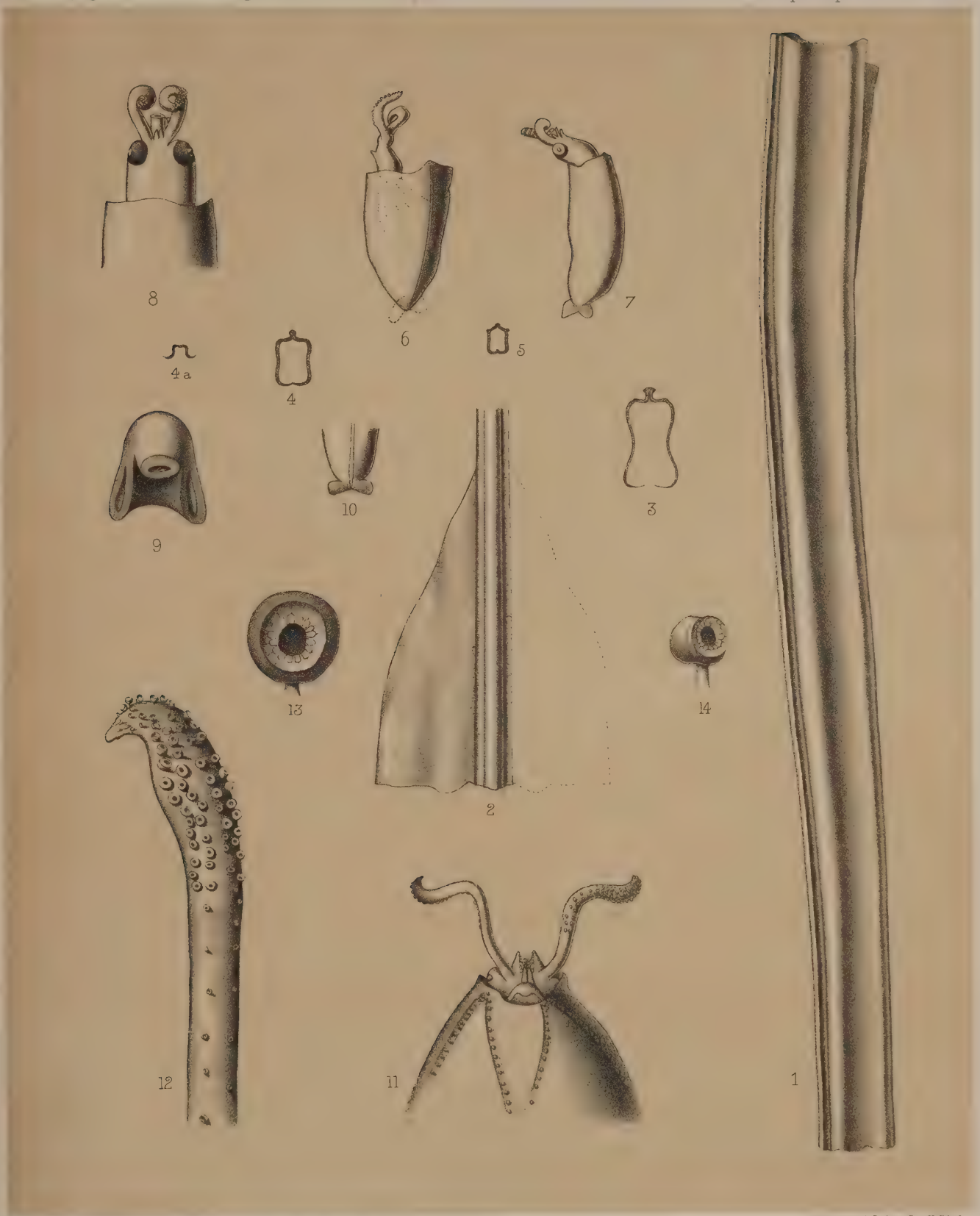
Figs. 11–14. CRANCHIA REINHARDTII, Steenstrup, . . 184

Fig. 11. Ventral aspect of the head and anterior part of the mantle; magnified 4 diameters.

Fig. 12. The extremity of the tentacle; magnified 20 diameters.

Fig. 13. One of the larger suckers from the tentacle; magnified 200 diameters.

Fig. 14. One of the smaller suckers from the tentacle; magnified 200 diameters.



A. Pollock, del.

M'Farlane & Erskine Lith.rs Edin.

1–5. CHIROTEUTHIS (?) sp. 6–10. TRACHELOTEUTHIS (?) 11–14. CRANCHIA REINHARDTII Stp.

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Figs. 1–4. CRANCHIA REINHARDTII, Steenstrup, . . 184

Fig. 1. Anterior aspect of the head and arms; magnified 7 diameters.

Fig. 2. Dorsal view of the posterior extremity of the body, showing the form of the fin; magnified about 3 diameters.

Fig. 3. Lateral aspect to show the form of the end of the body; magnified about 3 diameters.

Fig. 4. A specimen showing a tapering posterior extremity to the body; slightly enlarged.

Figs. 5–11. TAONIUS SUHMI (Lankester), ... 192

Fig. 5. Ventral aspect of one of the specimens; natural size.

Fig. 6. A sucker from one of the sessile arms; considerably enlarged.

Fig. 7. One of the median tentacular suckers; magnified 30 diameters.

Fig. 8. The horny ring of a similar sucker; magnified 30 diameters.

Fig. 9. The extremity of the tentacle; magnified 8 diameter.

Fig. 10. A specimen from the Atlantic Ocean, preserved in alcohol; magnified 8 diameters.

Fig. 11. The "complete" specimen, drawn from a microscopic preparation of Dr. v. Willemoes-Suhm; magnified 8 diameters.

Fig. 12. TAONIUS HYPERBOREUS, Steenstrup, . . 191

Fig. 12. Anterior view of the arms and circumoral region, showing the enlarged suckers on the lateral arms; the dorsal aspect is downwards; natural size. Drawn by Mr. Thornam from the type specimen in the Copenhagen Museum.

A. Pollock, lith. M'Farlane & Erskine, Lith^rs Edin^r

1–4, CRANCHIA REINHARDTII, Stp. 5–11, TAONIUS SUHMI (Lankester)
12, TAONIUS HYPERBOREUS, Stp.

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Figs. 1–11. TAONIUS HYPERBOREUS, Steenstrup, . . 191

Fig. 1. Dorsal view of the type specimen; one-half natural size.

Fig. 2. Front view of an enlarged sucker, from one of the lateral arms; magnified 4 diameters.

Fig. 3. Side view of the same sucker; magnified 4 diameters.

Fig. 4. Front view of a similar sucker; less enlarged.

Fig. 5. Side view of the same sucker as fig. 4; less enlarged.

Fig. 6. The inner aspect of the tentacular club; natural size.

Fig. 7. A portion of the stem; enlarged to show the suckers and fixing-cushions.

Fig. 8. Three views of a large tentacular sucker; somewhat magnified.

Fig. 9. Front view of a similar sucker; magnified about 10 diameters.

Fig. 10. A sucker and fixing-cushion from the stem of the tentacle; magnified about 30 diameters.

Fig. 11. The gladius of a smaller specimen from the "Porcupine" collection; natural size.

Figures 1, 4, 5, 6, 7, 8, were drawn by Mr. Thornam from the type specimen in the Copenhagen Museum.

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Fig. 12. The right tentacular club; magnified about 5 diameters.

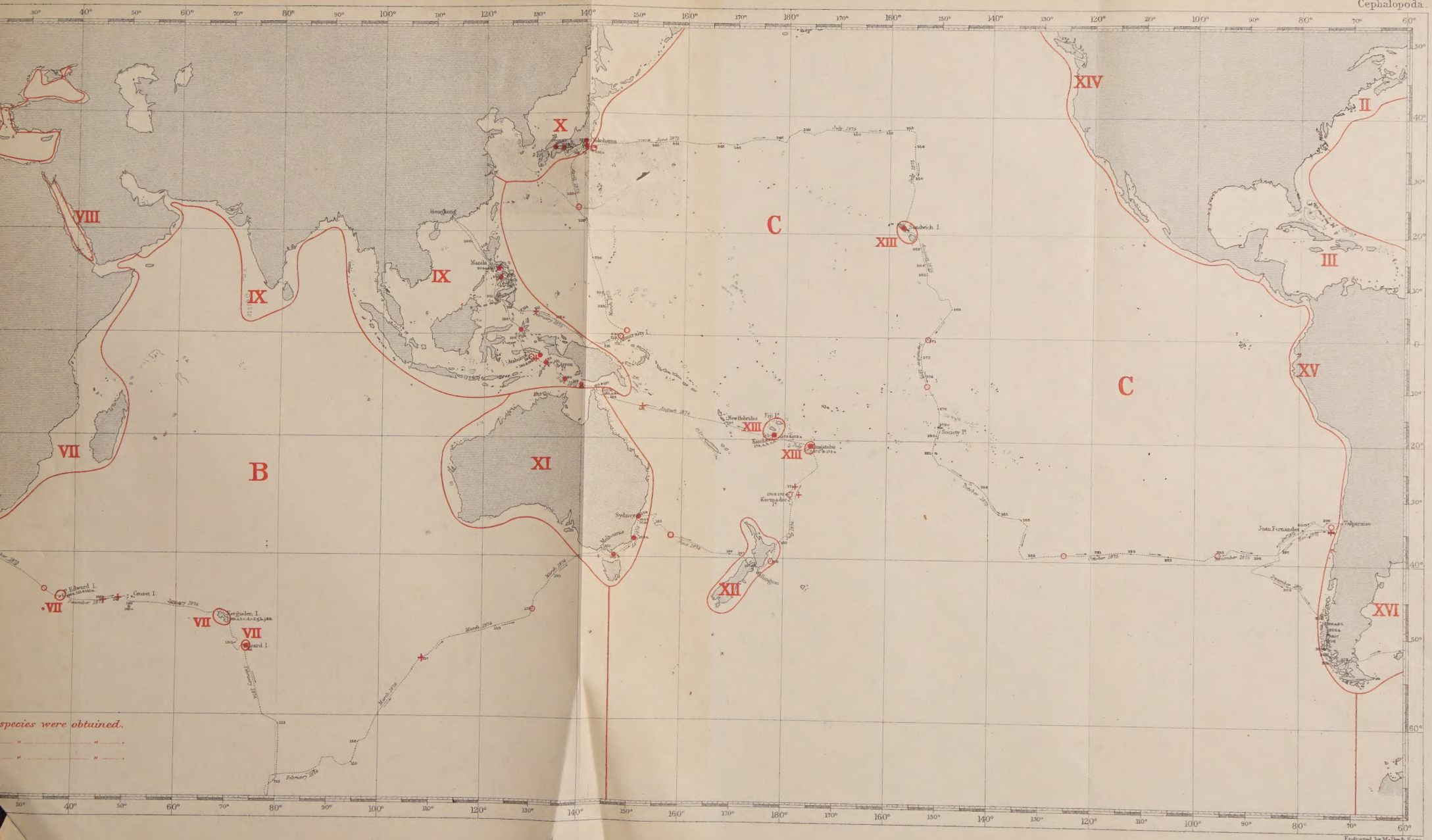
Fig. 13. One of the larger tentacular suckers; magnified 40 diameters.

Fig. 14. A portion of the horny ring and papillary area; magnified 250 diameters.

Fig. 15. Dorsal and lateral views of the gladius; natural size.

A. Pollock, lith. McFarlane & Erskine, Lith^rs Edin^r

1–11, TAONIUS HYPERBOREUS, Stp. 12–15, CALLITEUTHIS REVERSA, Vll.



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